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FINAL TIER II SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER TREATMENT ZERO-VALENT IRON PERMEABLE REACTIVE BARRIER PILOT STUDY OPERABLE UNIT 1 (OU1) MCAS CHERRY POINT NC

5/1/2012

CH2M HILL

Final

Tier II Sampling and Analysis Plan

Groundwater Treatment Zero-Valent Iron Permeable Reactive Barrier Pilot Study, Operable Unit 1

Marine Corps Air Station
Cherry Point, North Carolina

Naval Facilities Engineering Command

Prepared for

Department of the Navy

Naval Facilities Engineering Command Mid-Atlantic

Contract No.
N62470-08-D-1000
CTO-0097

May 2012

Prepared by

CH2MHILL

Title and Approval Page

(UFP-QAPP Manual Section 2.1 – Worksheet #1)

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Under the
NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by:

CH2MHILL

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Nicole Cowand/ NAVFAC Remedial Project Manager Date

Gena Townsend/USEPA Region 4 Remedial Project Manager Date

George Lane/NCDENR Remedial Project Manager Date

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Executive Summary

CH2M HILL has prepared this document under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, Comprehensive Long-term Environmental Action—Navy (CLEAN) 1000 Contract No. N62470-08-D-1000, Contract Task Order (CTO) 097, in accordance with the Navy's Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP) policy guidance to ensure that environmental data collected are scientifically sound, of known and documented quality, and suitable for intended uses. The *Final Remedial Investigation Report for Operable Unit 1 (OU1 RI), Marine Corps Air Station, Cherry Point, North Carolina* (Tetra Tech NUS, Inc., 2002),the *OU1 Remedial Investigation Addendum, Marine Corps Air Station Cherry Point, Cherry Point, North Carolina* (*OU1 RI Addendum*) (CH2M HILL, 2009), and the *Final OU1 Central Groundwater Plume Feasibility Study, Marine Corps Air Station Cherry Point, North Carolina (OU1 FS)* (CH2M HILL 2011) provide additional information and background on MCAS Cherry Point, OU1, and the Central Groundwater Plume.

This UFP-SAP is prepared to support the field sampling activities associated with the Permeable Reactive Barrier (PRB) groundwater treatment pilot study at OU1, located at Marine Corps Air Station (MCAS) Cherry Point, North Carolina (**Figures 1 and 2**). The pilot study includes the installation of a 600 feet (ft) long, 2-ft wide trench with sand and zero-valent iron (ZVI), installation of 15 new monitoring wells, and groundwater sampling from 19 monitoring wells over six rounds of data collection. Details related to the design and construction of the PRB are provided in a separate work plan.

The pilot study is being conducted to: (1) measure the effectiveness of the PRB at treating the OU1 Central Groundwater Plume and preventing discharge to surface water at East Prong Slocum Creek and Sandy Branch; and (2) to determine if the PRB can be installed to a depth of 45 feet (ft) below ground surface using the DeWind One-Pass Trench System, which may allow for construction of a PRB near Sandy Branch instead of injection borings.

OU1 is an industrial area of approximately 565 acres in the southwestern portion of MCAS Cherry Point. The primary chemicals of concern (COCs) in the Central Groundwater Plume are chlorinated volatile organic compounds (cVOCs) that include trichloroethene (TCE), dichloroethene (1,2-DCE), vinyl chloride (VC), 1,1-dichloroethane (1,1-DCA), and 1,1-dichloroethene (1,1-DCE). These chemicals generally exceeded the regulatory standards at a frequency of greater than 10 percent. Other COCs detected less frequently include tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), and 1,2-dichloroethane (1,2-DCA).

A Feasibility Study (FS) was finalized in 2011 that evaluated potential groundwater remedial alternatives at OU1 (CH2M HILL, 2011). A PRB was considered a viable treatment alternative for the downgradient portion of the plume. This pilot study will be used to evaluate the ability of the PRB to achieve 90 percent reduction of TCE and 75 percent reduction of overall VOCs in the immediately downgradient monitoring wells, although these specific percentages are not critical in achieving protection of Slocum Creek.

Field sampling activities for the PRB pilot study include:

- Collecting groundwater samples from two existing monitoring wells and performing a bench-scale study to determine site-specific half-life information
- Site preparation, including clearing vegetation, removing fencing, temporarily removing overhead power lines, and grading to maintain a level work surface
- Surveying of the proposed PRB location
- Utility locating along proposed PRB location, 5 soil sampling locations, and 15 proposed monitoring well locations
- Collecting 10 soil samples for grain size analysis from 5 soil sampling locations

- Installing an approximately 600-footlong sand and ZVI combination PRB
- Installing 15 new monitoring wells
- Surveying of the 15 new monitoring wells and final PRB location
- Sampling of the 15 new monitoring wells and 4 existing wells
- Site restoration

The PRB effectiveness will be tracked through six groundwater monitoring events: baseline, 3 months, 6 months, 9 months, 12 months, and 24 months. Samples will be collected from 15 new monitoring wells and 4 existing monitoring wells and will be analyzed for select VOCs. Select geochemical parameters (pH, dissolved oxygen [DO], oxidation-reduction potential [ORP], nitrate, and sulfate) will also be analyzed during sampling events using field test kits.

The laboratory information cited in this SAP is specific to APPL, Inc. If additional laboratory services are requested requiring modification to the existing SAP, revised SAP worksheets will be submitted to the Navy and regulatory agencies for approval.

Contents

Figures

Acronyms and Abbreviations

AM	Activity Manager
amsl	above mean sea level
AS/SVE	air sparing/soil vapor extraction
CA	corrective action
CLP	Contract Laboratory Program
COC	contaminant of concern
cVOC	chlorinated volatile organic compound
CSM	conceptual site model
CTE	central tendency exposure
CTO	Contract Task Order
DL	Detection Limit
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DoD ELAP	Department of Defense Environmental Laboratory Accreditation Program
DPT	direct push technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
DV	data validation
EIS	Environmental Information Specialist
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft/day	foot per day
ft/ft	foot per foot
FQM	Field Quality Manager
FTL	Field Team Leader
FRCE	Fleet Readiness Center—East
GC-MS	gas chromatograph/mass spectrometer
GPS	Global Positioning System
GW	groundwater
HI	hazard index
HHRA	human health risk assessment
HRC®	Hydrogen Release Compound
HSM	Health & Safety Manager
HSO	Health and Safety Officer
ID	inner diameter
ICAL	initial calibration
IDW	investigation derived waste
IWTP	Industrial Wastewater Treatment Plant
LCS	laboratory control sample
LOD	Limit of Detection
LOQ	Limit of Quantitation
µg/L	micrograms per liter
mg/L	milligrams per liter
MCL	Maximum Contaminant Level
MPC	measurement performance criteria
MS/MSD	matrix spike/matrix spike duplicate

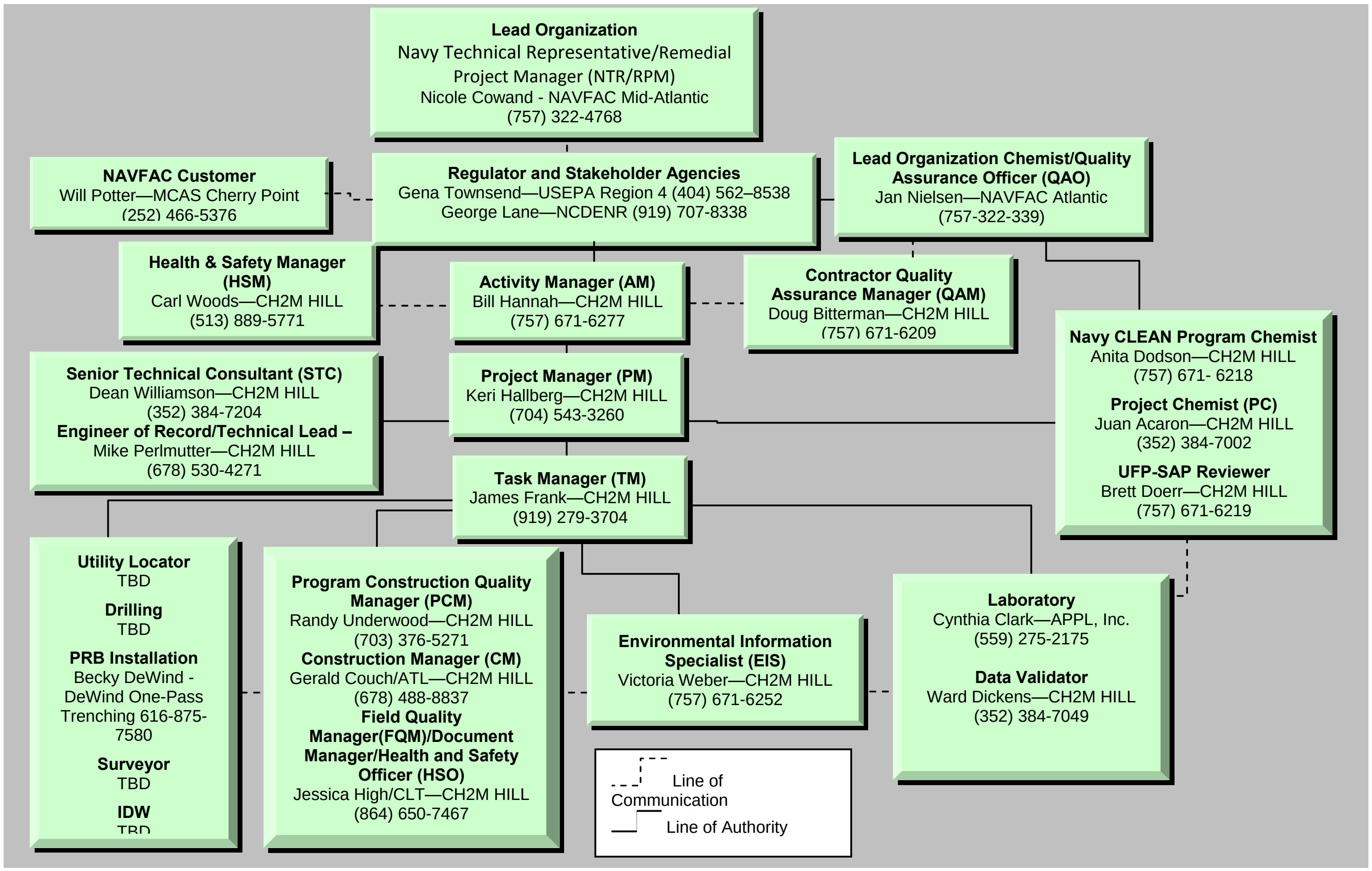
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCGWQS	North Carolina Groundwater Quality Standards
NIRIS	Navy Installation Restoration Information Solution
PAHs	polyaromatic hydrocarbons
PAL	Project Action Limit
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCBs	polychlorinated biphenyls
PDM	Project Data Manager
PID	photoionization detector
PM	Project Manager
POC	point of contact
PRB	permeable reactive barrier
PQL	practical quantitation limit
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	auality control
QL	Quantitation Limit
QSM	Quality Systems Manual
RI	Remedial Investigation
RME	reasonable maximum exposure
RPD	relative percent difference
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SQL	Sample Quantitation Limit
STC	Senior Technical Consultant
SVOC	Semivolatile Organic Compound
SW	surface water
TAT	turnaround time
TCLP	Toxicity Characteristic Leaching Procedure
TBD	to be determined
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VGM	Voluntary Groundwater Monitoring
VOA	volatile organic analyte
VOC	volatile organic compound
WQPs	water quality parameters

1 Project Organization

(UFP-QAPP Manual Section 2.4.1 – Worksheet #3, #4, #5, #6, #7, and #8 Elements)

1.1 Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1 – Worksheet #5)



1.2 Communication Pathways

(UFP-QAPP Manual Section 2.4.2 – Worksheet #6)

The communication pathways for the Sampling and Analysis Plan (SAP) are shown below.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
Communication with Navy (lead agency)	Navy NTR/RPM	Nicole Cowand	nicole.cowand@navy.mil (757) 322-4768	Primary point of contact (POC) for Navy; can delegate communication to other internal or external POCs. RPM will notify the U.S. Environmental Protection Agency (USEPA) and North Carolina Department of Environment and Natural Resources (NCDENR) via email or telephone within 24 hours of field changes affecting the scope or implementation of the design. Navy will have 30 days for SAP review. All sampling data will be presented and discussed during partnering meetings.
Communication with USEPA Region 4	USEPA Region 4 RPM	Gena Townsend	townsend.gena@epa.gov (404) 562-8538	Primary POC for USEPA; can delegate communication to other internal or external POCs. Upon notification of field changes, USEPA will have 24 hours to approve or comment on the field changes. All data results will be presented and discussed during partnering meetings.
Communication with NCDENR	NCDENR RPM	George Lane	george.lane@ncdenr.gov (919) 707-8338	Primary POC for NCDENR; can delegate communication to other internal or external POCs. Upon notification of field changes, NCDENR will have 24 hours to approve or comment on the field changes. All data results will be presented and discussed during partnering meetings.
Communication regarding overall project status and implementation and primary POC with Navy RPM, USEPA, and NCDENR	CH2M HILL AM	Bill Hannah	bill.hannah@ch2m.com (757) 671-6277	Oversees project and will be informed of project status by the PM. If field changes occur, the AM will work with the Navy RPM to communicate field changes to the team via email within 24 hours. All data results will be communicated to the project team during the first partnering meeting following data receipt.
Technical communications for project implementation, and data interpretation	CH2M HILL STC	Dean Williamson	dean.williamson@ch2m.com (352) 384-7204	Team members will contact the STC regarding questions/issues encountered in the field, input on data interpretation, etc., as needed. The STC will have 24 hours to respond to technical field questions as necessary. Additionally, the STC will review the data (as necessary) prior to partnering team discussion and reporting review.
Quality issues during project implementation and data interpretation	CH2M HILL QAM for MCAS Cherry Point	Doug Bitterman	doug.bitterman@ch2m.com (757) 671-6209	Team members will contact the QAM regarding quality issues during project implementation. The QAM will report to the AM, the CH2M HILL Program Quality Manager, and the NAVFAC Atlantic QAO.
Communications regarding project management and implementation	PM	Keri Hallberg	keri.hallberg@ch2m.com (704) 543-3260	Responsible for forwarding all information and materials about the project to the Navy, AMs, and the STC as necessary. POC for field sampling team.

Communication Drivers	Responsible Affiliation	Name	Phone Number and/or E-mail	Procedure, Pathway, etc.
Assists with communications regarding project management and implementation	TM	James Frank	james.frank@ch2m.com (919) 760-1755	Assists PM with communication with project team and the STC as necessary. Additional POC for field sampling team.
Health and Safety (H&S)	CH2M HILL Safety Coordinator (SC)	Jessica High	Jessica.High@ch2m.com (864) 650-7467	Responsible for the adherence of team members to the site safety requirements described in the Health and Safety Plan (HSP). Will report H&S incidents and near misses to the PM.
SAP changes in field	FQM	Jessica High	Jessica.High@ch2m.com (864) 650-7467	Prepares documentation of deviations from the SAP in the field logbook and immeidaitely notifies the PM. Deviations will be made only with approval from the PM.
Quality Assurance Project Plan (QAPP) Field Changes/ Field Progress Reports	FQM	Jessica High	Jessica.High@ch2m.com (864) 650-7467	Prepares documentation of field activities and SAP deviations (made with the approval of the AM and/or QAO) in field logbooks; provides daily progress reports to the PM.
Data tracking from field collection to database upload	Environmental Information Specialist (EIS)	Victoria Weber	victoria.brynildsen@ch2m.com (757) 671-6252	Tracking data from sample collection through database upload.
Reporting Laboratory Data Quality Issues	Laboratory PM	Cynthia Clark	(559) 275-2175	All quality assurance (QA)/quality control (QC) issues with project field samples will be reported within 1 day to the PC by the laboratory. Should analytical laboratory issues affect data usability by rendering a significant amount of rejectable or unusable data, such that the project completeness goal cannot be obtained, the PC will notify the project team, including the Navy RPM and Navy QAO.
Reporting Data Validation (DV) Issues	DV	Ward Dickens	ward.dickens@ch2m.com (352) 384-7049	All DV issues regarding resubmissions from the laboratory will copy the CH2M HILL EIS on communications. The DV report will be due within 14 calendar days of data receipt.
Field and analytical corrective actions (CAs)	PC	Juan Acaron	juan.acaron@ch2m.com (352) 384-7002	CAs for field and analytical issues will be determined by the FTL and/or the PC and reported to the PM within 4 hours.
Release of Analytical Data	PC	Juan Acaron	juan.acaron@ch2m.com (352) 384-7002	No analytical data can be released until validation of the data is completed and has been approved by the PC. The PC will review analytical results within 7 days of receipt for release to the project team.
Field CAs	FQM TM PM	Jessica High James Frank Keri Hallberg	Jessica.High@ch2m.com (864) 650-7467 james.frank@ch2m.com (919) 760-1755 keri.hallberg@ch2m.com (704) 543-3260	Field and analytical issues requiring CA will be determined by the FQL and TM or PM; the PM will ensure QAPP requirements are met by field staff.

2 Project Approach

(UFP-QAPP Manual Section 2.5.1 – Worksheet #9, #10, #11, #12, #17 Elements)

2.1 Project Planning Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1 – Worksheet #9)

Project Name:	OU1, Site 16 zero-valent iron (ZVI) permeable reactive barrier (PRB) Pilot Study	**Site Name:**	MCAS Cherry Point OU1
Projected Date(s) of Sampling:	November/December 2011	**Site Location:**	MCAS Cherry Point, North Carolina
Project Manager: Keri Hallberg			
Date of Session:	9-13-11		
Scoping Session Purpose:	Obtain concurrence on PRB layout, well locations, and sampling plan		

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jason Williams	Navy RPM	NAVFAC Mid-Atlantic	(757) 322-4088	**jason.e.williams@navy.mil**	RPM
Will Potter	Cherry Point RPM	EAD MCAS Cherry Point	(252) 466-5376	**william.r.potter@usmc.mil**	Base Rep
Gena Townsend	EPA RPM	USEPA Region 4	(404) 562-8538	**townsend.gena@epa.gov**	EPA Rep
George Lane	NCDENR RPM	NCDENR	(919) 707-8338	**george.lane@ncdenr.gov**	State Rep
Bill Hannah	CH2M HILL AM	CH2M HILL	(757) 671-6277	**bill.hannah@ch2m.com**	Contractor Rep

Comments/Decisions: **Consensus Decisions:** Consensus was reached on the PRB pilot test and sampling locations, as well as analytical parameters and sampling frequency, as follows:

- Conduct a bench-scale ZVI column study.
- Collect 10 soil samples for grain size analysis (American Society for Testing and Materials [ASTM] D422).
- Install 600-foot (ft) long, curved, and 2-ft wide PRB and 15 new monitoring wells.
- Collect baseline groundwater samples from the 15 new monitoring wells and 4 existing monitoring wells.
- Collect post-PRB installation samples at 3 months, 6 months, 9 months, 12 months, and 24 months for the 15 new monitoring wells and 4 existing wells. Analytical parameters will include select VOCs. In addition, field parameters (pH, DO, ORP, nitrate, and sulfate) will be analyzed during sampling events.

2.2 Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2 – Worksheet #10)

This section provides a summary of site background and key elements of the conceptual site model (CSM), followed by a narrative description of the problems to be addressed during the proposed pilot study.

2.2.1 Background

MCAS Cherry Point

MCAS Cherry Point is a 13,164-acre military reservation adjacent to the city of Havelock in southeastern Craven County, North Carolina (**Figure 1**). MCAS Cherry Point was commissioned in 1942 and provides support facilities and services for the Second Marine Aircraft Wing, the Fleet Readiness Center—East (FRCE) (formerly Naval Aviation Depot), Combat Service Support Detachment 21 of the Second Marine Logistics Group, the Naval Air Maintenance Training Group Detachment, and the Defense Reutilization and Marketing Office. MCAS Cherry Point maintains facilities for training and for supporting the Atlantic Fleet Marine Force aviation units and is designated as a primary aviation supply point.

MCAS Cherry Point is bounded by the Neuse River to the north, Hancock Creek to the east, and North Carolina Highway 101 to the south. The western boundary is an irregular property line located approximately 0.75-mile west of Slocum Creek.

In 1943, a massive aircraft assembly and repair facility (FRCE) was added. Hazardous wastes have been generated through historical aircraft assembly and maintenance operations since that time. These wastes have included plating wastes, organic solvents, paint removers and cleaners, oils and lubricants, waste petroleum, and polychlorinated biphenyls (PCBs).

OU1

OU1 is an industrial area of approximately 565 acres in the southwestern portion of MCAS Cherry Point (**Figures 2** and **3**). OU1 is bounded by C Street and Sandy Branch to the northwest, portions of the MCAS Cherry Point flightline and runway to the northeast and southeast, and East Prong Slocum Creek to the southwest.

Of the 11 sites identified in the Federal Facilities Agreement (FFA) investigated as part of the OU1 RI, six were identified as contributing to the OU1 Central Groundwater Plume contamination, as described in the OU1 RI Addendum (CH2M HILL, 2009). The locations of these sites are shown in **Figure 3**. These sites are:

- Site 42—Industrial Wastewater Treatment Plant (IWTP)
- Site 47—Industrial Area Sewer System
- Site 51—Building 137 Former Plating Shop
- Site 52—Building 133 Former Plating Shop and Ditch
- Site 92—VOCs in Groundwater near the Stripper Barn
- Site 98—VOCs in Groundwater near Building 4032

A brief description of these sites is included in **Table 1**.

TABLE 1

Site Descriptions

Site	Description
Site 42: IWTP	Originally constructed in 1957 to treat wastes from industrial sources such as metal plating, painting, aircraft maintenance, vehicle maintenance, and stormwater. A groundwater extraction and treatment system operated at the site from 1998 to 2005 to remediate the groundwater VOC plume in the vicinity of FRCE.
Site 47: Industrial Area Sewer System	Construction began in 1942 and was expanded over time for a system of underground pipes and aboveground drains to transfer industrial wastewater from various parts of FRCE and OU1 to the IWTP from processes such as metal plating, metal finishing, solvent degreasing, paint stripping, painting, fuel storage, fueling, aircraft washing, and general maintenance. Site 47 includes only the industrial sewers within OU1 that currently discharge to the IWTP. Concentrated wastes are now containerized and transported to the IWTP. Leaks were detected at several locations within the sewer system in the past and have been repaired. Inspections and repairs are conducted as part of the facility's ongoing maintenance process.
Site 51: Building 137 Former Plating Shop	A former Plating Shop that operated from 1942 to 1990 was located within Building 137, and consisted of approximately 4,000 square feet that included a 3-ft-deep sump for containment of spillage and tank overflows. The wastes generated in the Plating Shop consisted of plating solution overflow and rinse water containing zinc and chromium that were discharged to the sump. The sump discharged to the industrial sewer system (Site 47) until 1987, when the sump was plugged and the Plating Shop converted to a closed-loop system. From then until the Plating Shop was moved in 1990, wastes were transported to the IWTP (Site 42) in containers for batch treatment.
Site 52: Building 133 Former Plating Shop and Ditch	A former Plating Shop that operated from 1942 to 1990 was located in Building 133 and consisted of approximately 2,000 square feet that included a 2.5-ft-deep sump for containment of spillage and tank overflows. Former employees indicated that a ditch was formerly present behind Building 133 that received stormwater and industrial wastewater discharge from the Plating Shop and other areas within Building 133. This former ditch was covered in the 1970s by an addition to Building 133. The Plating Shop area was cleaned and renovated in 1996 and is currently used to process and store non-hazardous parts and supplies. The wastes generated in the Plating Shop consisted of plating solution overflow and rinse water that discharged to the sump. The sump wastes likely discharged to the former ditch behind Building 133 prior to the installation of the industrial sewer system (Site 47). An addition constructed on the southeastern side of the building subsequently covered this ditch. The sump then discharged to the industrial sewer system (Site 47) until 1987, when the sump was plugged and the Plating Shop converted to a closed-loop system. From then until the Plating Shop was moved in 1990, wastes were transported to the IWTP (Site 42) in containers for batch treatment.
Site 92: VOCs in Groundwater near the Stripper Barn	Site 92 is a plume of VOC-contaminated groundwater near the Stripper Barn portion of Building 137, where paint is removed from aircraft. The area around the site is covered with buildings and concrete, and portions of the industrial sewer system (Site 47) are located beneath and around the Stripper Barn. In the past, large quantities of solvent were used to remove paint; during the paint removal process, spent solvent flowed into the industrial sewer system. The current paint removal method requires approximately 90 percent less solvent, and spent solvent is captured for proper disposal. Any historical spills that occurred outside the building may have flowed toward storm drains located northeast of the Stripper Barn.
Site 98: VOCs in Groundwater near Building 4032	Site 98 is a plume of VOC-contaminated groundwater near Building 4032, located southeast of the IWTP in the central portion of OU1. Site 98 was discovered by MCAS Cherry Point during an investigation of underground storage tanks (USTs) at Building 4032 in 1994, and was identified as a new site in 1999.

2.2.2 Historical Site Investigations, Treatability Studies, and Remedial Actions

A comprehensive summary of historical activities and environmental investigations conducted at OU1 is provided in *Final Remedial Investigation for Operable Unit 1* (TetraTech NUS, 2002) and *OU1 Remedial Investigation Addendum* (CH2M HILL, 2009).

A summary of historical investigations, treatability studies, and previous remedial actions is provided in **Table 2.**

Conceptual Site Model

OU1 generally consists of paved or concrete surfaces with buildings throughout the area. The ground surface is relatively flat, ranging in elevation from 18 to 24 ft above mean sea level (amsl), except within the western portion of OU1 adjacent to East Prong Slocum Creek where the ground surface elevation drops to 2 ft amsl.

Surface water bodies present within OU1 include East Prong Slocum Creek and its tributaries School House Branch and Sandy Branch (**Figure 3**). School House Branch flows along the southeastern boundary of OU1. Two tributaries of Sandy Branch occur within the western portion of OU1, which flow to Sandy Branch, located along the western boundary of OU1. East Prong Slocum Creek is brackish, is larger than its two tributaries, and occurs along the southwestern boundary of OU1. From East Prong Slocum Creek, surface water flows into Slocum Creek and eventually the Neuse River. East Prong Slocum Creek, School House Branch, and Sandy Branch have been classified by NCDENR as Class C fresh water bodies.

The hydrogeologic framework to a depth of approximately 500 ft beneath OU1 consists of nine hydrostratigraphic units: five aquifers and four confining units. From shallowest (youngest) to deepest (oldest), the aquifers with associated confining units include the surficial, Yorktown, Pungo River, upper Castle Hayne, and lower Castle Hayne aquifers. A simplified CSM of OU1 is presented on **Figure 4**.

The locations of hydrogeologic cross-sections through OU1 are shown in **Figure 5**, with the conceptual cross-sections A-A’, B-B’, and C-C’ shown in **Figures 6** through **8**. VOC isoconcentrations are also shown in these cross-sections, illustrating vertical plume distribution.

The surficial aquifer is the first encountered groundwater beneath OU1 (depth of approximately 4 to 21 ft below ground surface [bgs]) and is unconfined. The saturated thickness ranges from approximately 30 to 45 ft beneath OU1, and is controlled by the fine grained Yorktown confining unit (generally sandy silt) at the base of the aquifer. The Yorktown aquifer occurs beneath the Yorktown confining unit and is generally a confined to semi-confined aquifer. The saturated thickness is approximately 40 ft and is controlled by the Yorktown confining unit at the top and the Pungo River confining unit at its base, where present. Groundwater contamination at OU1 has only been identified in the Surficial aquifer and not observed in the Pungo River, upper Castle Hayne, or lower Castle Hayne aquifers. Each aquifer is separated by a confining unit except where the units are absent or discontinuous.

A regional, Pleistocene-age paleochannel eroded the Yorktown and Pungo River confining units and deposited younger-aged sediments in the southwestern portion of OU1, including the area where the PRB will be located (**Figures 6** and **7**). As a result, the uppermost aquifers may be in direct hydraulic communication within the paleochannel where the confining units are absent. Groundwater levels northeast of the paleochannel boundary (outside the paleochannel) show a discontinuity across the Yorktown confining unit (which acts as an aquitard) and a downward vertical gradient from the surficial aquifer to the Yorktown aquifer. Groundwater levels southwest of the paleochannel boundary (within the paleochannel) generally show similar groundwater levels between the surficial and Yorktown aquifers and an upward vertical gradient from the Yorktown aquifer to the surficial aquifer.

TABLE 2

Summary of Historical Investigations, Treatability Studies, and Previous Remedial Actions

Investigation Phase	Date	Reference	Conclusions
Remedial Investigation	1983–2000	TetraTech NUS (2002)	Collection of soil samples from numerous sites within OU1, groundwater samples from four aquifers beneath OU1 (in descending order: surficial, Yorktown, Pungo River, and Castle Hayne aquifers), and surface water and sediment samples from Sandy Branch, School House Branch, East Prong Slocum Creek, and associated tributaries and drainage ditches. Primary contaminants within OU1 were determined to be polyaromatic hydrocarbons (PAHs), pesticides, and PCBs in soil, and VOCs in groundwater. Chlorinated VOCs (cVOCs) within groundwater were the most widespread primary contaminants at OU1. The target cVOCs within groundwater included 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), PCE, TCE, 1,1, 1-trichloroethane (1, 1,1-TCA), and the associated degradation products cis-1,2-dichloroethene (cis-1,2-dichloroethene [DCE]), trans-1,2-DCE, 1,2-dichloroethane (DCA), 1,1-DCA, and vinyl chloride (VC). TCE, total 1,2-DCE, VC, and 1,1-DCA were the most prevalent COCs detected. Groundwater contaminated with the target CVOCs generally occurred in two areas within OU1: a small area beneath the northern portion of Building 137 and a larger area extending from Building 133 and the IWTP to the Site 16 landfill. cVOCs were detected in the upper and lower surficial aquifers.
Building 137 Treatability Study	2000–2002	CH2M HILL (2003)	Single-event substrate injection of Hydrogen Release Compound (HRC®) into the surficial aquifer at Site 51, beneath Building 137. Groundwater monitoring for VOCs was conducted in a baseline round of sampling prior to the HRC® injection in late 2001 and during six post-injection monitoring events conducted over a 1-year period in 2002. Initial reduction of TCE concentrations was observed; however, rebound was observed in later sampling events.
Buildings 133 and 137 Treatability Study	2004–2005	CH2M HILL/ FIU (2007)	Tracer testing, baseline monitoring, EHC™ injection, and post-injection monitoring. Similar to the 2000-2002 study, concentrations initially decreased, then rebounded. It was concluded that impacts beneath Buildings 133 and 137 were not well understood and additional investigation was required.
Groundwater Extraction System	1998–2005	See CH2M HILL (2009) for full list of monitoring documents	The system was designed to extract groundwater from the central portion of the plume to an equalization tank containing an air diffusion system followed by treatment at the IWTP. The system was shut down in 2005 due to ineffective system performance and interference with the RI.
Downgradient Air Sparge System	1998–2005	See CH2M HILL (2009) for full list of monitoring documents	An air sparing/soil vapor extraction (AS/SVE) system was installed and began operation in 1998 at Site 16. The system was installed to treat contaminated shallow groundwater in place prior to its natural discharge to the adjacent surface water bodies. The system was shut down in 2005 due to ineffective system performance and interference with the RI.
OU1 Voluntary Groundwater Monitoring (VGM) Program	2004–2005	Agviq/CH2M HILL JV I (2005, 2006a, 2006b)	The objectives of the VGM program were to track potential plume migration and to maintain awareness of plume configuration. The VGM included the collection of water level measurements and groundwater samples from selected monitoring wells within OU1.

Investigation Phase	Date	Reference	Conclusions
Remedial Investigation Addendum	2005–2009	CH2M HILL (2009)	The additional site investigation activities included the collection of subsurface soil samples, monitoring well installation, water level monitoring, collection of groundwater samples, and aquifer hydraulic conductivity ("slug") testing. In addition, some sediment and surface water samples were collected within OU1 as part of ecological risk evaluations conducted following the 2002 RI. Similar to the findings of the 2002 RI, the most prevalent VOCs detected above regulatory standards within groundwater during the additional investigations (in order based on the greatest frequency of exceedances) included TCE, VC, 1,2-DCE, and 1,1-DCE. These chemicals generally exceeded the regulatory standards at a frequency of greater than 10 percent. Other VOCs related to chlorinated solvents detected above regulatory standards included PCE, 1,1,1-TCA, 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), 1,1-DCA, and 1,2-dichloroethane (1,2-DCA), but less frequently. Benzene and other petroleum-related hydrocarbons are being investigated under the MCAS Cherry Point UST Program and were not discussed as part of the RI Addendum.
2009 Additional Investigation	2009	CH2M HILL (2010a)	Installation and sampling of 4 upper surficial aquifer and 5 lower surficial aquifer monitoring wells to the north, northeast, and downgradient of existing monitoring well 42GW15, to further characterize the cVOC plume along Sandy Branch Tributary #2. Installation and sampling of 1 lower surficial aquifer monitoring well to delineate the southern extent of the cVOC plume. Installation and sampling of 2 lower surficial aquifer monitoring wells to further assess the horizontal extent of elevated cVOC concentrations (i.e. above 10 times the North Carolina Groundwater Quality Standard [NCGWQS]) in the downgradient portion of the plume. Installation and sampling of 1 upper surficial aquifer monitoring well at each of Sites 16, 17, and 83 (total of 3 monitoring wells) to serve as part of potential monitoring well networks for long-term monitoring. Sampling from 170 existing monitoring wells to establish baseline conditions prior to implementation of a remedial action, to provide another temporal groundwater monitoring event at monitoring wells only sampled once, and to further assess the plume stability and natural attenuation conditions.

Groundwater flows generally westward in the surficial aquifer toward East Prong Slocum Creek and Sandy Branch at an average horizontal hydraulic gradient of approximately 0.003 foot per foot (ft/ft). The average linear horizontal groundwater velocity in the surficial aquifer is estimated at approximately 0.1 to 0.2 foot per day (ft/day). The 2009 groundwater elevation maps are provided as **Figure 9 and 10**.

Nature and Extent of Contamination

The most prevalent VOCs detected above regulatory standards within the Central Groundwater Plume (in order based on the greatest frequency of exceedances) include TCE, VC, 1,2-DCE, 1,1-DCA, and 1,1-DCE. These chemicals generally exceed the regulatory standards at a frequency of greater than 10 percent in monitoring wells. Other VOCs related to chlorinated solvents detected above regulatory standards, but less frequently, included PCE, 1,1,1-TCA, 1,1,2,2-PCA, and 1,2-DCA.

Three distinct plumes of TCE and its degradation products occur within OU1 (**Figures 11** through **16**). The most elevated TCE concentrations (**Figures 11** and **12**) occur beneath Building 133, at concentrations that may be indicative of the presence of dense non-aqueous phase liquid (DNAPL) (maximum concentration of 17,000 micrograms per liter (µg/L). Beneath Building 133, TCE generally occurs only within the upper surficial aquifer and was not observed in the lower surficial aquifer. TCE extends from the upper surficial aquifer into the lower surficial aquifer at locations downgradient of Building 133, and the plume extends from the western portion of the building more than 3,000 ft to East Prong Slocum Creek and Sandy Branch. TCE was not observed on the western side of the creeks, as the plume is believed to discharge to the creeks.

Another distinct TCE plume occurs within the upper surficial aquifer beneath Building 137 and extends a few hundred feet in the southwestern direction beneath the building. The plume extends from the upper surficial aquifer to the lower surficial aquifer downgradient of Building 137 and mixes with the plume from beneath the IWTP.

A third TCE groundwater plume within the upper surficial aquifer occurs near the IWTP. The TCE plume from this area migrates within the upper and lower surficial aquifers beneath Tributary #2 to Sandy Branch and also joins the larger plume that extends from Building 133.

Detections of 1,2-DCE (**Figures 13** and **14**) and VC (**Figures 15** and **16**) generally occur in the monitoring wells where exceedances of the NCGWQS for TCE were recorded. The most elevated concentration of cis-1,2-DCE (maximum concentration of 4,200 µg/L) was detected within the lower surficial aquifer just downgradient of Building 133. The most elevated concentration of VC (maximum concentration of 650 µg/L) was also detected in the lower surficial aquifer, downgradient of Building 133. Similar to TCE, 1,2-DCE and VC contamination extends from the upper surficial aquifer beneath Building 133 to the lower surficial aquifer downgradient of the building, and further to Sandy Branch and East Prong Slocum Creek.

Concentrations of 1,1-DCE generally exceed the NCGWQS in a small area within the upper surficial aquifer beneath Building 137, within the lower surficial aquifer downgradient of Building 137 and upgradient of the IWTP, and within the upper surficial aquifer beneath the IWTP. Concentrations of 1,1,1-TCA were detected above the NCGWQS at only one monitoring well completed within the upper surficial aquifer at Building 137.

Benzene and other petroleum-related hydrocarbons are being investigated under the MCAS Cherry Point UST Program and are not addressed as part of this investigation. However, the presence of petroleum compounds as a carbon source can contribute to the degradation of cVOCs in groundwater. Two separate petroleum plumes occur within the upper surficial aquifer to the northwest and beneath the northwestern portions of Buildings 133 and 137 (Catlin, 2008a and 2008b).

Twelve other VOCs and four SVOCs generally exceed their respective NCGWQS at a frequency of less than 10 percent. Other cVOCs with concentrations above the NCGWQS in descending order of exceedance frequency included PCE, 1,1-DCA, 1,1,2,2-PCA, 1,2-DCA, and bromodichloromethane. PCE generally occurs at locations with elevated concentrations of TCE within the upper surficial aquifer beneath Buildings 133 and 137. 1,1-DCA was detected primarily beneath Buildings 133 and 137, whereas 1,2-DCA concentrations consist only of localized detections at individual monitoring wells.1,1,2,2-PCA was detected above the NCGWQS only within the upper surficial aquifer at multiple monitoring wells in Site 16. Bromodichloromethane was detected inconsistently and infrequently (CH2M HILL, 2009).

Receptors

As depicted on **Figure 4**, potential current receptors include industrial workers and construction workers. In the future, potential receptors could also include hypothetical residential receptors.

The updated human health risk assessment (HHRA) presented in the OU1 RI Addendum (CH2M HILL, 2009) determined that potable use of the surficial aquifer groundwater by future residents may result in unacceptable risk. The noncarcinogenic hazard to both a child and adult resident and carcinogenic risk to the lifetime resident using the surficial aquifer groundwater as a potable water supply exceeded USEPA acceptable levels for both reasonable maximum exposure (RME) and central tendency exposure (CTE) point evaluations. These hazards and risks were primarily associated with cVOCs (PCE, TCE, and VC contributing the greatest risk and hazard), with additional contributions from benzene and arsenic.

The updated HHRA also determined that exposure to surficial aquifer groundwater by a construction worker would result in a hazard index (HI) of 1.7. However, no individual constituents or target organs had HIs above USEPA's target level of 1.0. The carcinogenic risk to a future construction worker from exposure to surficial aquifer groundwater was within USEPA's target risk range. As a result, there were no calculated hazards or risks to a future construction worker above USEPA's target levels. Potential risks to industrial workers related to vapor intrusion is currently under evaluation.

2.3 Data Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1 – Worksheet #11)

2.3.1 Problem Statement

A Feasibility Study (FS) (CH2M HILL, 2011a) was conducted to assess remedial alternatives at OU1. Installation of a ZVI PRB was determined to be a likely viable treatment alternative for the downgradient portion of the plume. As shown on **Figures 11** through **16**, two areas in the downgradient portion of the plume require treatment to prevent cVOCs from potentially reaching surface water bodies. The FS indicated that a PRB would have to be installed to a depth of approximately 35-40 ft bgs in the southern lobe of the plume to prevent cVOCs from discharging to Slocum Creek, and that a PRB would have to be installed to a depth of approximately 45 ft bgs in the northern lobe to prevent cVOCs from discharging to Sandy Branch. The FS also indicated that a PRB using the One-Pass Trencher on the northern lobe would be more cost-effective to install and maintain than a PRB installed using injection methods. However, using the One-Pass Trencher to reach 45 ft bgs has not yet been field tested.

The pilot study will include installation of a curved, 600-ft long ZVI PRB using the DeWind One-Pass Trencher to an attempted depth of 45 ft bgs. The pilot study is planned to assess the potential effectiveness of this alternative and to determine the feasibility of installing the ZVI PRB using the DeWind One-Pass Trench system to a depth of 45 ft bgs.

The pilot study will be conducted on the southern lobe of the plume. This lobe was selected for the pilot study due to the shallower PRB depth requirement. If the PRB fails to reach the target depth of 45 ft, but reaches 35-40 ft, it will still be effective in protecting Slocum Creek. Full pilot study design details are provided in the *Draft ZVI PRB Pilot Study Implementation Plan* (CH2M HILL, 2011b).

A bench-scale study will be performed by Adventus to determine site-specific half-life information for the cVOCs in contact with the ZVI. The site-specific half-lives will be used as selection criteria for the required ZVI concentration and PRB thickness. Groundwater samples will be collected from monitoring wells 16GW34 and 16GW35 to be used in the bench-scale study.

Fifteen new monitoring wells will be installed to monitor barrier effectiveness (see Section 2.5.3 for well location rationale). Seven monitoring wells will be installed in the upper surficial aquifer and 8 in the lower surficial aquifer. The 2-inch-diameter wells will be constructed using a 10-ft section of 0.010-inch slot polyvinyl chloride (PVC) screen.

Groundwater samples will be collected from the pilot study area to monitor the effectiveness of the PRB. Samples will be collected from the 15 newly installed monitoring wells (16GW53 to 16GW67) and four existing monitoring wells (16GW28, 16GW29, 16GW34, and 16GW35). Baseline sampling will be conducted upon completion of the new monitoring well installations, just after construction of the PRB. Additional groundwater monitoring will be conducted after 3, 6, 9, 12, and 24 months following PRB installation.

The samples will be analyzed for the following VOCs which were identified as COCs during the RI:

- 1,1,1-TCA
- 1,1,2,2-Tetrachloroethane (1,1,2,2-PCA)
- 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)
- 1,1,2-TCA
- 1,1-DCA
- 1,1-DCE
- 1,2-DCA
- cis-1,2-DCE
- Trans-1,2-dichloroethene (trans-1,2-DCE)
- Bromodichloromethane
- Bromoform
- Chloromethane
- Dichlorodifluoromethane (Freon-12)
- Methylene chloride
- PCE
- TCE
- VC

2.3.2 Environmental Questions to be Answered

The purposes of the pilot study are (1) to assess the potential effectiveness of the ZVI PRB alternative, and (2) to assess the feasibility of installing the PRB to a depth of 45 ft bgs using the DeWind One-Pass Trench system. With respect to the first objective, the specific results will be used to assess the ability of the PRB to reduce COC concentrations to below surface water standards at the point of compliance (Slocum Creek). The pilot study will also evaluate the ability of the PRB to achieve 90 percent reduction of TCE in the immediately downgradient monitoring wells and 75 percent reduction of overall VOCs, although attainment of these specific percentages are not critical in achieving protection of Slocum Creek. COCs currently exceeding screening criteria in the vicinity of the proposed PRB include PCE, TCE, vinyl chloride, and chloromethane. Only the COCs present above screening levels in the baseline results will be included in the reduction calculations. The following are the specific environmental questions to be answered by the pilot study:

Is installation of a ZVI PRB to a depth of 45 ft bgs feasible using the DeWind One-Pass Trencher?

Use of the DeWind One-Pass Trencher has only been field tested to a depth of 40 ft but is expected to be able to reach a depth of 45 ft under conditions such as those at OU1. As part of the pilot study, DeWind will attempt to use the One-Pass Trencher to install the PRB to a depth of 45 ft bgs.

What is the proper grain size of the sand/ZVI mix to be used in the PRB?

Ten soil samples will be collected from 5 collocated sampling locations and analyzed for grain size by ASTM D422 within the vicinity of the proposed ZVI PRB to adequately quantify the effective porosity of the native soils. Five soil samples will be collected from a depth of 20 ft bgs and 5 from a depth of 40 ft bgs. The samples will be collected using direct push technology (DPT). The results will be used to select the proper grain size of sand in the sand/ZVI mix, which will allow for an appropriate transmissivity across the PRB to be achieved.

Are native soils removed during trenching operations considered hazardous for disposal?

Soil samples will also be submitted for Toxicity Characteristic Leaching Procedure (TCLP) analysis. These samples will be collected from the soil cuttings collected during the monitoring well installation within the vicinity of the ZVI PRB and from one sample per 500 tons of homogeneous soil removed during trenching operations. The TCLP results will allow for investigation derived waste (IDW) characterization during installation of the PRB.

Will groundwater flow through the PRB as intended?

Several rounds of groundwater elevation data were collected, and groundwater elevation contour maps prepared for the OU1 RI Addendum were reviewed prior to proposing the PRB location. The review of the groundwater elevation contour maps in conjunction with data collected during the summer and fall of 2011 provide reasonable confidence of the direction of groundwater flow through seasonal fluctuations in groundwater elevation over time. This review of recent and historic data thus provides reasonable confidence that the orientation of the PRB will remain perpendicular to groundwater flow despite temporal variability due to weather conditions throughout a given year. The overall curve of the PRB is also intended to prevent groundwater from flowing along the length of the PRB and out the end without being treated.

Additionally, data collected from the 15 new monitoring wells and the 4 existing wells will provide further indication of the extent to which flow through the PRB is occurring as intended.

What are the target VOC concentrations and groundwater geochemistry across the study areas prior to groundwater treatment (i.e., baseline)?

Baseline sampling will be conducted at the 15 newly installed monitoring wells and 4 existing wells. The new wells will be installed and both new and existing wells will be sampled within 2 weeks of PRB installation. It is anticipated that the collected samples will be representative of baseline conditions because groundwater will not have had sufficient time to move through the PRB due to the low groundwater velocity at the site.

The data from these wells will be used to outline the study area properties at baseline conditions and help evaluate post-treatment conditions and the effectiveness of the pilot study technology. Groundwater samples from the monitoring wells will be analyzed in the laboratory for select VOCs and in the field for pH, DO, ORP, nitrate, and sulfate (to determine groundwater geochemistry). Subsequently collected data sets will be compared to baseline data.

Is the remedial technology expected to be effective at achieving the target TCE and overall VOC reductions in the study area?

Groundwater samples will be collected at intervals of 3, 6, 9, 12, and 24 months post–PRB installation from the 15 newly installed monitoring wells and 4 existing wells. The sampling intervals will provide data on COC and geochemical changes quarterly over the first year (when the most significant changes are expected). The data point collected at 24 months will assist in determining whether conditions are stable and whether potential iron passivation may be occurring.

Groundwater samples will be analyzed in the laboratory for select VOCs and in the field for pH, DO, ORP, nitrate, and sulfate. The resulting VOC data will then be compared to the baseline concentrations to calculate the percent reductions and determine technology effectiveness. The remaining analytes provide data regarding the effectiveness of the PRB in producing highly reducing conditions in the study area.

Who will use the data?

The data will be used by the Navy and stakeholder agencies (i.e., USEPA and NCDENR) to determine the potential effectiveness of the ZVI PRB alternative and, if deemed effective, whether installation using the One-Pass Trencher is feasible to a depth of 45 ft bgs. This determination will be used to assess the feasibility of implementing this technology and installation method on the northern lobe of the plume.

2.3.3 Project Action Limits (PALs)

Concentrations of the groundwater contaminants identified in the investigation will be compared to the lower of the NCGWQS and USEPA Maximum Contaminant Levels (MCLs).

Per North Carolina regulations (15A North Carolina Administrative Code [NCAC] 02L.0202 (b)(1)), when the regulatory standard for a particular constituent is less than the laboratory's practical quantitation limit (PQL), a concentration at or above the PQL constitutes a violation of the standard. The laboratory for this project is operating under DoD (Department of Defense) QSMV4.1 criteria such that when this situation occurs, any detect at or above the limit of quantitation (LOQ) constitutes a violation of the standard; likewise, a detection below the LOQ does not constitute a violation of the standard as the reported value is an estimated value.

What will the data be used for?

The baseline data will be used to establish conditions at the beginning of the study for comparison to data collected at 3, 6, 9, 12, and 24 months.

Groundwater data collected beginning 3 months after installation of the PRB will be used to evaluate the effectiveness of the potential remedy and support stakeholder decisions for remedy selection and design. All data will be included in a post-implementation Pilot Study Report.

Data collected will be used to prepare a Pilot Study Report outlining the effectiveness of the PRB, installation method, and, if effective and the stakeholders agree, proposal of this technology as the final remedy for both lobes of the plume.

What types of data are needed?

Baseline data are needed to allow for accurate comparison of pre- and post-implementation conditions in the study area. Post-PRB installation monitoring data are needed to study the temporal and spatial variability and effectiveness of the treatment. Groundwater analyses are summarized in **Worksheet #15**.

All groundwater samples will be submitted for laboratory analysis to an offsite laboratory (APPL, Inc.).

The water quality parameters to be measured using field tests during the groundwater monitoring event will include:

- pH
- DO
- ORP
- Nitrate
- Sulfate

Are there any special data quality needs, field or laboratory, in order to support environmental decisions?

No.

How will data be collected and generated? How will the data be reported?

CH2M HILL staff will oversee the installation of the proposed PRB and monitoring wells. They will also collect the groundwater samples from the newly installed and existing monitoring wells, as outlined above.

Laboratory analyses will be performed by APPL, Inc. under subcontract to CH2M HILL.

Once generated, VOC analytical data collected during the final round of sampling will be submitted to Ward Dickens of CH2M HILL for validation against analytical methodology requirements and measurement performance criteria (MPC) presented in this SAP.

CH2M HILL will receive validated data and upload the data into a centralized electronic database used for Navy projects (Navy Installation Restoration Information Solution [NIRIS]) by the project team(s).

How will the data usability be documented?

Data will be reported in the Quarterly Pilot Study Reports, which will be submitted to the Navy as a draft for review prior to distribution to the NCDENR and USEPA for review and approval.

How will the data be archived?

Data will be archived according to procedures dictated via the Navy CLEAN program/ contract. All data will be uploaded into a centralized database developed and maintained by CH2M HILL and used for Navy projects and will also be loaded into NIRIS. At the end of the project, paper copies of archived laboratory data and validation reports will be archived by Iron Mountain.

Project Quality Objectives listed in the form of if/then qualitative and quantitative statements.

Decision trees for the pilot study are presented below to illustrate the project quality objectives regarding the constructability and effectiveness of the PRB technology.

Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

- Non-detected constituents will be evaluated to ensure that project required quantitation limits in **Worksheet #15** were achieved. If project quantitation limits were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable.
- The DV is the only party that may apply qualifiers to the data. Minor QC exceedances will result in “estimated” data, represented by J, J+, J-, NJ, and UJ qualifiers. Major QC exceedances will result in “rejected” data, represented by R-qualifiers. The effect on availability and usability of rejected results will be evaluated.
- For duplicate sample results, the most conservative value will be used for project decisions.
- Analytical data will be checked to ensure the values and any qualifiers are appropriately transferred to the electronic database. These checks include comparison of hardcopy data and qualifiers to the electronic data deliverable. Once the data have been uploaded into the electronic database, another check will be performed to ensure all results were loaded accurately.
- Field and laboratory precision will be compared as relative percent difference (RPD) between the two results.
- Deviations from the SAP will be reviewed to assess whether CA is warranted and to assess impacts on achievement of project objectives.

Describe the evaluative procedures used to assess overall measurement error associated with the project:

- To assess whether a sufficient quantity of acceptable data are available for decision-making, the data will be reconciled with MPC following validation and review of data quality indicators (DQIs) .
- If significant biases are detected with laboratory QA/QC samples, they will be evaluated to assess their impact on decision-making. Low biases will be described in greater detail as they represent a possible inability to detect compounds that may be present.

If significant deviations are noted between lab and field precision, the cause will be further evaluated to assess the impact on decision-making.

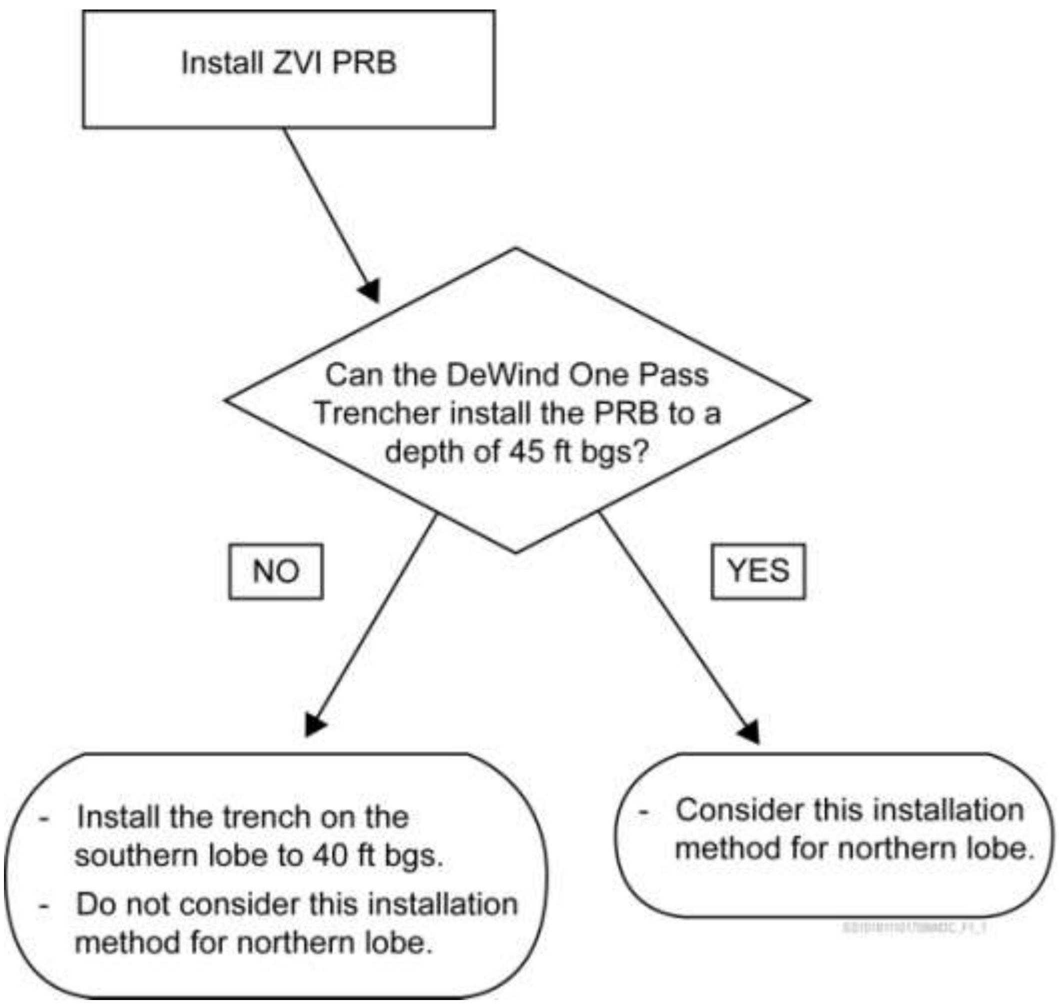
Describe the documentation that will be generated during the usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

- Data tables will be produced to reflect detected and non-detected constituents and geochemical parameters. Data qualifiers will be reflected in the tables and discussed in the Quarterly Pilot Study Reports.
- A data validation report will be provided as an appendix to the Final Pilot Study Report.
- If needed, a technical memorandum will be produced that will identify any data usability limitations and make recommendations for CA.

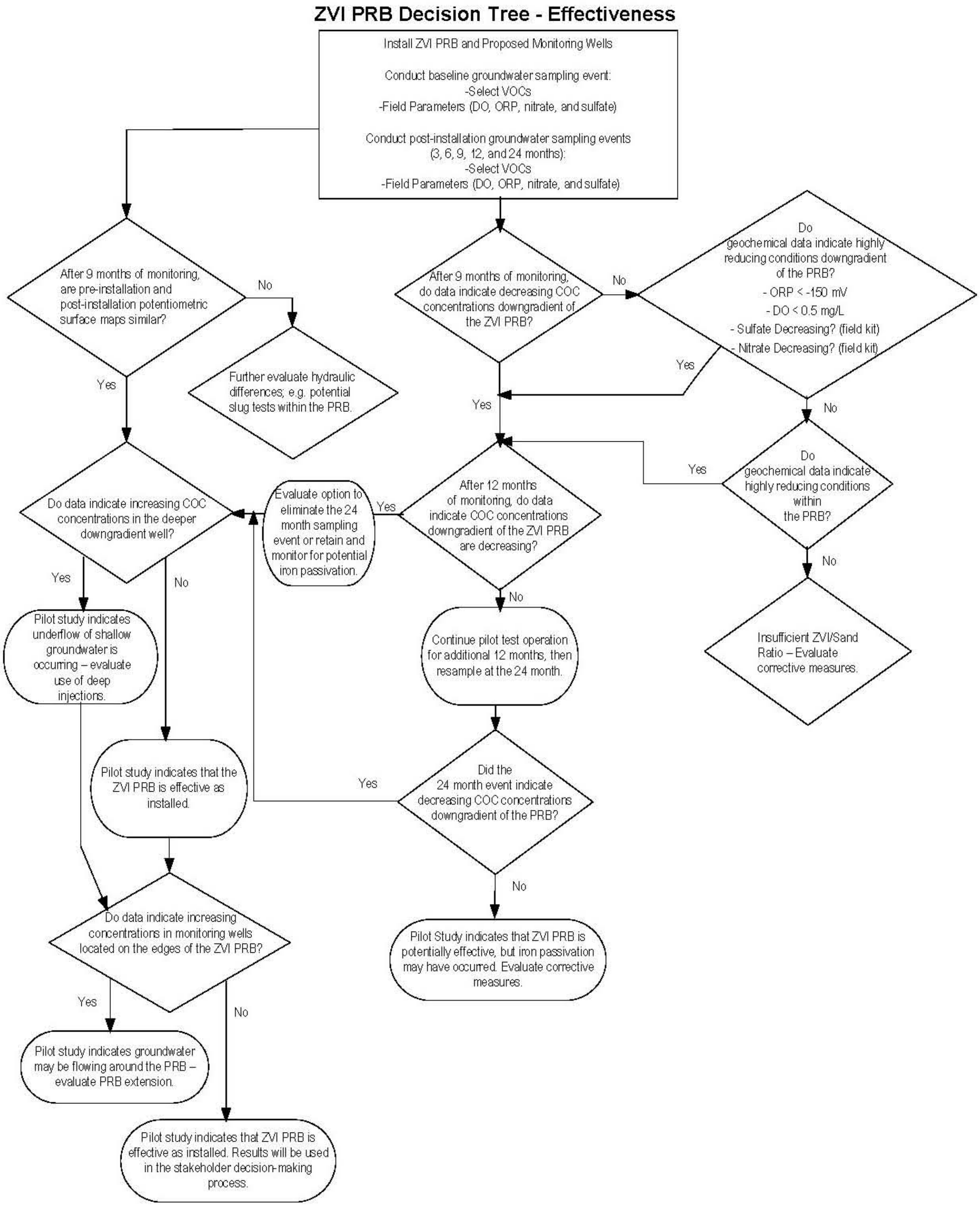
Identify the personnel responsible for performing the usability assessment:

- The CH2M HILL PM, PC, and other team members as necessary.

ZVI PRB Decision Tree - Constructability



ZVI PRB Decision Tree - Effectiveness



2.4 Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2 – Worksheet #12-1)

Matrix: Groundwater and Aqueous (Blanks)
Concentration Level: Low (SW-846 8260B)

Measurement Performance Criteria Table – Field QC Samples

QC Sample[1]	Analytical Group	Frequency	DQIs	MPC
Field Duplicate	VOC	One per 10 normal field samples	Precision	%RPD ≤20%
Equipment Rinseate Blank	VOC	One per day for decontaminated equipment	Bias / Contamination	Same as method blank. Refer to **Worksheet # 28-1.**
Trip Blank	VOC	One per cooler containing VOCs	Bias / Contamination	Same as method blank.
Temperature Blank	VOC	One per cooler	Representativeness	0-6°C
Field Duplicate	VOC	One per 10 normal field samples	Precision	%RPD ≤20%

Notes:
[1]MS/MSD is described on **Worksheet #28.**

(UFP-QAPP Manual Section 2.6.2 – Worksheet #12-2)

Matrix: Subsurface Soil
Concentration Level: N/A (ASTM D422)

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group	Frequency	DQIs	MPC
N/A: Field QC samples are not planned for grain size (sieve) analysis.				

2.5 Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1 - Worksheet #17)

2.5.1 General Approach

The general sampling approach was developed to gather data specifically related to the effectiveness of the ZVI PRB throughout the pilot study.

2.5.2 Sample Matrices

Sample matrices are limited to samples of groundwater (target medium for pilot study)from the target monitoring wells and soil(medium necessary to determine proper sand/ZVI mixture) from the borings installed for grain size analysis.

2.5.3 Analytical Groups

Grain size analyses will be performed on 10 soil samples, collected along the length of the PRB prior to installation. These analyses are necessary to determine the appropriate sand/ZVI mixture to install in the PRB.

Groundwater analytical groups are limited to target VOCs which have been detected above PALs during previous investigations. Results will be used to evaluate the treatment approach.

Reference Areas, Sample Numbers, and Locations

Soil samples will be collected from 5 borings spaced relatively evenly along the length of the PRB (OU1-16SB01 through OU1-16SB05) prior to installation.

Groundwater samples will be collected from selected wells, including the 15 newly installed monitoring wells (**Figure 17**) and 4 existing wells; the rationale for the locations is provided below. Samples from these wells will provide baseline and temporal data to evaluate PRB effectiveness.

Proposed Monitoring Wells

- 16GW53—Upper Surficial Aquifer Monitoring Well—located northeast of PRB to evaluate the COC concentrations in the low-concentration portion of the upper Surficial aquifer plume that is not intercepted by the PRB to the northeast
- 16GW54—Lower Surficial Aquifer Monitoring Well—located northeast of PRB to evaluate the COC concentrations in the low-concentration portion of the lower Surficial aquifer plume that is not intercepted by the PRB to the northeast
- 16GW55—Upper Surficial Aquifer Monitoring Well—located upgradient of the northeastern portion of the PRB to evaluate COC concentrations in the upper Surficial aquifer entering the PRB in the northeastern portion (will be compared to downgradient well 16GW29)
- 16GW56—Lower Surficial Aquifer Monitoring Well—located upgradient of the northeastern portion of the PRB to evaluate COC concentrations in the lower Surficial aquifer entering the PRB in the northeastern portion (will be compared to downgradient well 16GW28)
- 16GW57—Upper Surficial Aquifer Monitoring Well—located upgradient of the central portion of the PRB to evaluate COC concentrations in the upper Surficial aquifer entering the PRB at the curve
- 16GW58—Lower Surficial Aquifer Monitoring Well—located upgradient of the central portion of the PRB to evaluate COC concentrations in the lower Surficial aquifer entering the PRB at the curve

- 16GW59—Upper Surficial Aquifer Monitoring Well— located downgradient of the central portion of the PRB to evaluate COC concentrations in the upper Surficial aquifer flowing out of the PRB at the curve (will be compared to upgradient well 16GW57)
- 16GW60—Lower Surficial Aquifer Monitoring Well— located downgradient of the central portion of the PRB to evaluate COC concentrations in the lower Surficial aquifer flowing out of the PRB at the curve (will be compared to upgradient well 16GW58)
- 16GW61—Deeper Lower Surficial Aquifer Monitoring Well— located downgradient of the central portion of the PRB to evaluate whether impacted groundwater is flowing under the PRB
- 16GW62—Upper Surficial Aquifer Monitoring Well—located upgradient of the southern portion of the PRB to evaluate COC concentrations in the upper Surficial aquifer entering the PRB in the southern portion
- 16GW63—Lower Surficial Aquifer Monitoring Well— located upgradient of the southern portion of the PRB to evaluate COC concentrations in the lower Surficial aquifer entering the PRB in the southern portion
- 16GW64—Upper Surficial Aquifer Monitoring Well— located downgradient of the southern portion of the PRB to evaluate COC concentrations in the upper Surficial aquifer flowing out of the PRB in the southern portion (will be compared to upgradient well 16GW62)
- 16GW65—Lower Surficial Aquifer Monitoring Well— located downgradient of the southern portion of the PRB to evaluate COC concentrations in the lower Surficial aquifer flowing out of the PRB in the southern portion (will be compared to upgradient well 16GW63)
- 16GW66—Upper Surficial Aquifer Monitoring Well— located south of the PRB to evaluate the COC concentrations in the low-concentration portion of the upper Surficial aquifer plume that is not intercepted by the PRB to the south
- 16GW67—Lower Surficial Aquifer Monitoring Well— located south of the PRB to evaluate the COC concentrations in the low-concentration portion of the lower Surficial aquifer plume that is not intercepted by the PRB to the south

Sampling Frequency

During project scoping, the Partnering Team agreed to collect baseline groundwater samples in order to effectively evaluate pre-treatment conditions in each portion of the treatment area. Baseline data will be collected from 15 newly installed monitoring wells and 4 existing monitoring wells. Groundwater samples will be collected and analyzed for the following:

- VOCs (select list)
- pH (via field test)
- ORP (via field test)
- DO (via field test)
- Nitrate (via field test)
- Sulfate (via field test)

Table 4 indicates the total number of samples to be collected.

TABLE 4

Samples to be Collected

Matrix	Depth of Samples	Analysis	Method	Number of Samples (Baseline and Periodically Following Injections)	Rationale	Sampling Strategy
Soil from 5 soil borings	20 and 40 ft bgs	Grain Size	ASTM D422	10 Baseline	Sand grain size selection for PRB	See **Figure 17** for sampling locations
Groundwater from 15 new monitoring wells and 4 existing wells	Middle of well screen	VOCs: • 1,1 DCA • 1,1 DCE • 1,1,1 TCA • 1,1,2 TCA • 1,1,2,2 PCA • 1,2 DCA • Cis-1,2-DCE • Trans-1,2-DCE • Bromodichloromethane • Bromoform • Chloromethane • Methylene Chloride • PCE • TCE • VC	SW-846 Method 8260B	Baseline: 19 3 Month: 19 6 Month: 19 9 Month: 19 12 Month: 19 24 Month: 19	•Degradation rates •Temporal changes	See **Figure 17** for sampling locations.
		Additional Parameters: • pH • ORP • DO • Nitrate • Sulfate	Field Meters • pH: Standard Methods 4500-H+; EPA 150.2 • ORP: Standard Methods 2580 and Field Testing Kits • DO: Chemetrics Kit: Rhodazine D Method; Range: 0-1 milligrams per liter (mg/L); MDL: 0.025 ppm • Nitrate:Cadmium Reduction Method, Range 0 - 50 mg/L • Sulfate: Chemetrics Kit: Turbidimetric Method Range: 8 -100 mg/L	Baseline: 10 3 Month: 10 6 Month: 10 9 Month: 10 12 Month: 10 24 Month: 10	•Groundwater geochemistry (e.g. reducing conditions) •Temporal changes	

2.6 Data Verification and Validation (Steps I and IIa/IIb) Process Table

(UFP-QAPP Manual Section 5.2.1, UFP-QAPP Manual Section 5.2.2, Figure 37 UFP-QAPP Manual, Table 9 UFP-QAPP Manual – Worksheets #34, 35, 36)

Data Review Input	Description	Responsible for Verification	Internal / External[1]
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	Field Team Leader: James Frank/CH2M HILL	Internal
Chain-of-Custody Forms and Shipping Forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody will be initialed by the reviewer, a copy of the chain-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	Field Team Leader: James Frank/CH2M HILL Project Data Manager (PDM) PDM: Victoria Weber/CH2M HILL	Internal / External
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the PDM in the form of laboratory logins.	PDM: Victoria Weber/CH2M HILL	External
Documentation of Laboratory Method Deviations	Laboratory Method Deviations will be discussed and approved by the PC. Documentation will be incorporated into the case narrative, which becomes part of the final hardcopy data package.	Project Chemist: Juan Acaron/CH2M HILL	Internal
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check).	PDM: Victoria Weber/CH2M HILL	External
Case Narrative	Case narratives will be reviewed by the DV during the data validation process. This is verification that they were generated and applicable to the data packages.	Data Validator: Ward Dickens/CH2M HILL	External
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	Laboratory QA Officer (APPL)	Internal
Laboratory Data	The data will be verified for completeness by the PDM.	PDM: Victoria Weber/CH2M HILL	External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and CA forms will be reviewed internally to ensure that all appropriate CAs have been taken and that CA reports are attached. If CAs have not been taken, the PM will be notified to ensure action is taken.	Project Manager: Keri Hallberg/CH2M HILL Project Chemist: Juan Acaron/CH2M HILL	Internal / External
Corrective Action Reports	Corrective action reports will be reviewed by the PC or PM and placed into the project file for archival at project closeout.	Project Manager: Keri Hallberg/CH2M HILL Project Chemist: Juan Acaron/CH2M HILL	External
Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods.	Project Chemist: Juan Acaron/CH2M HILL	External
Target Compound List and Target Analyte List	Ensure the laboratory reported all analytes from each analysis group as per **Worksheet #15.**	Project Chemist: Juan Acaron/CH2M HILL	External
Reporting Limits	Ensure the laboratory met the project-designated quantitation limits as per **Worksheet #15**. If quantitation limits were not met, the reason will be determined and documented.	Project Chemist: Juan Acaron/CH2M HILL	External
Laboratory Standard Operating Procedures (SOPs)	Ensure that approved analytical laboratory SOPs were followed.	Data Validator: Ward Dickens/CH2M HILL	External
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered by the DV during the data validation process.	Data Validator: Ward Dickens/CH2M HILL	External
Raw Data	10 percent review of raw data to confirm laboratory calculations.	Data Validator: Ward Dickens/CH2M HILL	External
Onsite Screening	All non-analytical field data will be reviewed against QAPP requirements for completeness and accuracy based on the field calibration records.	Field Team Leader: James Frank/CH2M HILL	Internal
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Data Validator: Ward Dickens/CH2M HILL	External
Documentation of field QC Sample Results	Establish that all required QAPP QC samples were run and met limits.	Project Chemist: Juan Acaron/CH2M HILL Data Validator: Ward Dickens/CH2M HILL	External
Analytical Data Validation (VOCs)	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. QA/QC criteria for field QC samples are presented in **Worksheet #12.** Target compound lists, LOQs, Limits of Detection (LODs), and Detection limits (DLs) are presented in **Worksheet #15.** QA/QC criteria for calibrations are presented in Lab SOP ANA8260B (referenced in **Worksheet #23**). QA/QC criteria for laboratory QC samples are presented in **Worksheet #28.** Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in National Functional Guidelines for Organic Data Review (USEPA, 1999). 100% of the VOC data generated will undergo analytical data validation. Of the 100% validated, 10% of results will be re-calculated from the raw data to verify calculations.	Data Validator: Ward Dickens/CH2M HILL	External

[1]Internal / External is with respect to the data generator.

3 Field Project Implementation

(Field Project Instructions) (Worksheet #14, #18, #19, #20, #21, and #30)

3.1 Field Project Tasks

(UFP-QAPP Manual Section 2.8.1 – Worksheet #14)

3.1.1 Utility Clearance

Prior to initiation of intrusive sampling activities, all buried utilities will be identified by a subcontracted utility locator. In addition, ground penetrating radar will be used to identify subsurface anomalies which may represent debris and could interfere with PRB installation.

3.1.2 Land Surveying

Land surveying services will be conducted in accordance with Section 3.3 of the Master Project Plans. The surveying will be conducted in two phases:

Phase 1 will occur prior to soil sample collection and will entail surveying the location of the proposed PRB.

Phase 2 will be conducted after PRB and well installation is complete and will entail surveying the as-built PRB, monitoring well locations, and monitoring well top-of-casing elevations.

3.1.3 Vegetation Clearing

Vegetation clearing will be conducted as needed for installation of the PRB. All vegetation, including large trees, will be removed from the PRB location.

3.1.4 Grading

Grading will be conducted as required to maintain a level work surface for the DeWind One-Pass Trencher.

3.1.5 Soil Sample Collection

A DPT rig will be used to collect subsurface soil samples from 2 depths (15 ft bgs and 30 ft bgs), in accordance with the Direct-Push Soil Sample Collection SOP.

Each location will be continuously sampled for lithologic characterization and allowing for the discrete depth selection for a soil sample to be collected for laboratory analysis. Continuous cores will be recovered using an open core barrel and piston DPT sampling device along with 4- or 5-ft disposable acetate liner. A new liner will be used in collecting each continuous sample from the ground surface down to the bottom of the borehole, and the down-hole sampling equipment will be decontaminated between each sampling location.

3.1.6 Monitoring Well Installation

The monitoring wells to be installed within the upper surficial aquifer will be screened from roughly 15 to 25 ft bgs, while the lower surficial wells will be screened from roughly 35 to 45 ft bgs. One monitoring well will be installed and screened within the deeper portion of the lower surficial aquifer, from roughly 45 to 55 ft bgs. All well borings will be advanced using rotosonic drilling techniques. Final well depths may be modified by the field geologist to adjust for field conditions. Continuous soil cores will be collected for lithologic characterization and field screened for VOCs using a photoionization detector (PID) as the borehole is advanced. Precise well construction depths will be determined in the field following a review of the soil cores. The well construction details are summarized in Table 5.

TABLE 5

Well Construction Details

Monitoring Well ID	Aquifer Zone	Total Well Depth (ft bgs)	Screen Length (ft)	Screen Interval (ft bgs)
16GW53	Upper Surficial	26	10	15 - 25
16GW54	Lower Surficial	46	10	35 - 45
16GW55	Upper Surficial	26	10	15 - 25
16GW56	Lower Surficial	46	10	35 - 45
16GW57	Upper Surficial	26	10	15 - 25
16GW58	Lower Surficial	46	10	35 - 45
16GW59	Upper Surficial	26	10	15 - 25
16GW60	Lower Surficial	46	10	35 - 45
16GW61	Lower Surficial (Deeper portion)	56	10	45 - 55
16GW62	Upper Surficial	26	10	15 - 25
16GW63	Lower Surficial	46	10	35 - 45
16GW64	Upper Surficial	26	10	15 - 25
16GW65	Lower Surficial	46	10	35 - 45
16GW66	Upper Surficial	26	10	15 - 25
16GW67	Lower Surficial	46	10	35 - 45

Installation Procedures

Monitoring Well Construction Procedures

Upon completion of the borehole to the desired depth, approximately 1 ft of sand filter pack will be placed on the bottom of the borehole by tremie method. Wells will be constructed using a 10-ft section of 2-inch-inner-diameter (ID), 0.010-inch factory slotted Schedule 40 PVC screen with a bottom cap. The screens will be connected to a threaded, flush-jointed, Schedule 40 PVC riser.

The annular space around the well screens will be filled with a well-graded, fine to medium silica sand filter pack consisting of a thoroughly washed, round, durable, siliceous, material containing less than 5 percent silt or clay. During placement of the filter pack, the well casing will be suspended above the bottom of the borehole. The casing will remain suspended until placement of the filter pack and transition seal (silica sand and bentonite) is completed. The top of the casing will have a temporary cap during installation of the annulus materials. The sand filter pack will extend to approximately 2 ft above the top of the screened interval. The filter pack will be installed in approximately 2-ft lifts to prevent bridging. The inner-most rotosonic casing will be moved upward as the annulus is filled. The depth to the top of the sand filter pack will be measured periodically using a weighted measuring tape.

Sodium bentonite pellets will be placed above the sand pack to form a seal at least 5 ft thick. The depth to the top of the bentonite seal will be measured periodically using a weighted measuring tape.

After hydration of the bentonite (at least 1 hour), the remaining borehole annular space will be completed with a cement-bentonite grout slurry using a side-discharge tremie method. The grout slurry will extend from the top of the bentonite seal to approximately 1 ft bgs.

Each monitoring well will be completed approximately 3 ft above ground surface with a lockable, steel protective stickup cover and 2-ft x 2-ft x 4-inch concrete pad. Four painted bollards (3.5 ft tall and 4-inch diameter) will be placed at each corner of the concrete pad, and each will be painted bright yellow. Sand will be placed in the annular space between the riser and protective cover. Well identification tags will be attached to the outside of the steel protective cover. An expansion plug and lock will be added to each monitoring well.

All drilling and well installation activities will be conducted by a North Carolina-licensed well driller, in accordance with the Well Construction Standards provided in the NCAC 15A Subchapter 2C Section 0100, under the supervision of a CH2M HILL engineer or hydrogeologist.

Well Development

Development pumping and surging will not start until the last pumped grout in the well has had at least 24 hours to cure. Each well will be developed by using a surge block and over-pumping. Well development will be considered complete when visible sediment is removed or 1 hour of active development has been completed, whichever is sooner. Field parameters (specific conductance, temperature, pH, DO, ORP, and turbidity) will be measured during development.

Sampling Tasks

- Groundwater Level Measurements:
  - Prior to purging, the depth to groundwater will be measured in each site monitoring well. Groundwater depths will be measured with a water level indicator to the nearest 0.01 ft. The downhole instruments will be decontaminated after use in each well, in accordance with SOP-012 (**Appendix B**).
- Collection of groundwater samples:
  - Refer to SOPs 004 (Low Flow Purging/ Sampling techniques), 008 (Blank Prep), 009 (Chain of Custody), and 010 (Shipping Samples) for specific implementation guidelines and details.
  - Groundwater samples will be collected from monitoring wells using a bladder or submersible pump. Monitoring wells will be purged in accordance with SOP-004 (**Appendix B**) low-flow sampling protocol. A list of all parameters to be analyzed is included in **Worksheets #17 (Section 2), #18, and #19 (Appendix A**).
  - All groundwater samples will be collected from monitoring wells by placing the pump intake at the middle of the well screen interval. Water quality parameters (WQPs) (specific conductance, pH, turbidity, temperature, DO, and ORP) will be measured and recorded (approximately every 5 minutes) prior to sampling using a multi-parameter water quality meter (e.g., Horiba U-22), calibrated at a minimum on a daily basis and as subsequently warranted. Sampling will begin when WQPs have stabilized for three consecutive readings and a minimum of one well volume has been purged. Depth to water, WQPs, total well depth measurements, and field kit testing results for nitrate and sulfate will be recorded on Groundwater Sampling Data Sheets.

- Decontamination
  - Refer to SOPs 012 and 013 (Decontamination Procedures) for specific implementation guidelines and details.
  - All non-disposable sampling equipment will be decontaminated before use and immediately after each use in accordance with applicable SOPs referenced in **Worksheet #21.** The water level indicator will be cleaned with deionized water between each measurement.
- IDW Handling
  - Refer to SOP 014 (IDW Handling) for specific implementation guidelines and details. Wastes generated during the investigation of potentially contaminated sites are classified as IDW and will be managed to protect human health and the environment, as well as to meet legal requirements. IDW is expected to consist of soil cuttings and drilling fluids from well installation, purge water from groundwater sampling, and disposable equipment items. Soil cuttings that are generated during this groundwater sampling event will be containerized for subsequent disposal. Soil cuttings will be transported to a storage location (TBD) located within OU1. Purge, development, and decontamination water will be discharged to the IWTP located near the center of OU1, north of A Street. The FTL will be responsible for the documentation, containerization, and offsite staging. IDW will be stored in approved, appropriately sized tank, drums, or roll-off box. The containers will be labeled in accordance with the Master Field Sampling Plan either with a preprinted label or paint pen.
- Analyses and Testing Tasks
  - The analytical laboratory will process and prepare samples for analyses and will analyze all samples for various groups of parameters in accordance with **Worksheet #17 (Section 2), #18, and #19 (Appendix A)**.
- Surveying
  - All newly installed monitoring wells will be surveyed in accordance with Navy CLEAN SOPs.

Quality Control Tasks

- Implement SOPs for field and laboratory activities. QC samples are described in the Sample Details Table.

3.2 Field SOPs Reference Table

(UFP-QAPP Manual Section 3.1.2 – Worksheet #21)

SOP Reference Number	Title/Author	Revision Date or Version Number	Location of SOP (if not included in the SAP)	Any planned deviation from SOP	Comments
SOP-001	Preparing Field Logbooks, CH2M HILL	Revised 05/2011		No	
SOP-002	Locating and Clearing Underground Utilities, CH2M HILL	Revised 05/2011		No	
SOP-003	Installation of Monitoring Wells by Sonic Drilling,CH2M HILL	Revised 05/2011		No	
SOP-004	Low-Flow Groundwater Sampling from Monitoring Wells, CH2M HILL	Revised 05/2011		No	
SOP-005	VOC Sampling—Water, CH2M HILL	Revised 05/2011		No	
SOP-006	Field Measurement of pH, Specific Conductance, Turbidity, DO, ORP, and Temperature Using a Water Quality Parameter Meter with Flow-through Cell, CH2M HILL	Revised 05/2011		No	
SOP-007	Water Level Measurement, CH2M HILL	Revised 05/2011		No	
SOP-008	Equipment Blank and Field Blank Preparation, CH2M HILL	Revised 05/2011		No	
SOP-009	Chain-of-Custody, CH2M HILL	Revised 05/2011		No	
SOP-010	Packaging and Shipping Procedures for Low-Concentration Samples, CH2M HILL	Revised 05/2011		No	
SOP-011	Multi RAE Photoionization Detector, CH2M HILL	Revised 05/2011		No	
SOP-012	Decontamination of Personnel and Equipment, CH2M HILL	Revised 05/2011		No	
SOP-013	Decontamination of Drilling Rigs and Equipment, CH2M HILL	Revised 05/2011		No	
SOP-014	Disposal of Waste Fluids and Solids, CH2M HILL	Revised 05/2011		No	
SOP-015	Direct Push Soil Sample Collection	Revised 05/2011		No	

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3.3 Sample Details Table

(UFP-QAPP Manual Sections 3.1.1 and 3.5.2.3 – Worksheets #18, 19, 20 and 30)

Sample Details (December 2011 Example)[1]

Navy CLEAN 8012 CTO-WE10 Cherry Point OU1 Site 16 tentatively. December 2011 APPL, Inc. Attn: Sample Receiving 908 North Temperance Ave. Clovis, CA 93611 (559) 275-2175 POC: Cynthia Clark (559) 275-2175 Ship all fractions to APPL.						**Analysis Group**	VOC	GRAINSIZE
						Preparation and Analytical Method	SW-846 8260B	ASTM D422
						Analytical Laboratory / Analytical SOP Reference	APPL / ANA8260B	Cooper Testing Labs / N/A
						Data Package Turnaround Time (TAT)	Standard 28 Calendar-day TAT	Standard 28 Calendar-day TAT
						Container Type / Volume Required	Three of 40mL VOA vials; no headspace	One of 8oz Jar; Fill Completely
						Preservative	HCl to pH < 2; Cool to 4°C	None (OK to cool)
						Holding Time (Preparation/Analysis)	14 days to Analyze when properly preserved	N/A
Site	**Matrix**	**Station ID**	**Sample ID**	**Coordinates**		**Depth / Sampling Interval**		
				X	**Y**			
OU1 / Site 16	GW	16GW28	OU1-16GW28-MMYY	421876.93	2627325.49	Screened Interval	1	
OU1 / Site 16	GW	16GW29	OU1-16GW29-MMYY	421888.35	2627326.37	Screened Interval	1	
OU1 / Site 16	GW	16GW34	OU1-16GW34-MMYY	421717.5	2627400.13	Screened Interval	1	
OU1 / Site 16	GW	16GW35	OU1-16GW35-MMYY	421716.09	2627392.88	Screened Interval	1	
OU1 / Site 16	GW	16GW53	OU1-16GW53-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW54	OU1-16GW54-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW55	OU1-16GW55-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW56	OU1-16GW56-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW57	OU1-16GW57-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW58	OU1-16GW58-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW59	OU1-16GW59-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW60	OU1-16GW60-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW61	OU1-16GW61-MMYY	TBD	TBD	~50' bgs	1	
OU1 / Site 16	GW	16GW62	OU1-16GW62-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW63	OU1-16GW63-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW64	OU1-16GW64-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW65	OU1-16GW65-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	GW	16GW66	OU1-16GW66-MMYY	TBD	TBD	~20' bgs	1	
OU1 / Site 16	GW	16GW67	OU1-16GW67-MMYY	TBD	TBD	~40' bgs	1	
OU1 / Site 16	SB	OU1-16SB01	OU1-16SB01-1520-MMYY	TBD	TBD	15-20" bgs		1
			OU1-16SB01-3540-MMYY	TBD	TBD	35-40" bgs		1
OU1 / Site 16	SB	OU1-16SB02	OU1-16SB02-1520-MMYY	TBD	TBD	15-20" bgs		1
			OU1-16SB02-3540-MMYY	TBD	TBD	35-40" bgs		1
OU1 / Site 16	SB	OU1-16SB03	OU1-16SB03-1520-MMYY	TBD	TBD	15-20" bgs		1
			OU1-16SB03-3540-MMYY	TBD	TBD	35-40" bgs		1
OU1 / Site 16	SB	OU1-16SB04	OU1-16SB04-1520-MMYY	TBD	TBD	15-20" bgs		1
			OU1-16SB04-3540-MMYY	TBD	TBD	35-40" bgs		1
OU1 / Site 16	SB	OU1-16SB05	OU1-16SB05-1520-MMYY	TBD	TBD	15-20" bgs		1
			OU1-16SB05-3540-MMYY	TBD	TBD	35-40" bgs		1
Field QC Samples[2]								
OU1 / Site 16	GW	TBD (Field Duplicate)	OU1-16GWXXP-MMYY	TBD	TBD	TBD	1	
OU1 / Site 16	GW	TBD (Field Duplicate)	OU1-16GWXXP-MMYY	TBD	TBD	TBD	1	
OU1 / Site 16	GW	TBD (Matrix Spike)	OU1-16GWXX-MMYY-MS	TBD	TBD	TBD	1	
OU1 / Site 16	GW	TBD (Spike Duplicate)	OU1-16GWXX-MMYY-SD	TBD	TBD	TBD	1	
OU1 / Site 16	AQ	OU1-QC (Equipment Blank)	OU1-EB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Equipment Blank)	OU1-EB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Equipment Blank)	OU1-EB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Equipment Blank)	OU1-EB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Equipment Blank)	OU1-EB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Trip Blank)	OU1-TB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Trip Blank)	OU1-TB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Trip Blank)	OU1-TB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Trip Blank)	OU1-TB01-MMDDYY	N/A	N/A	N/A	1	
OU1 / Site 16	AQ	OU1-QC (Trip Blank)	OU1-TB01-MMDDYY	N/A	N/A	N/A	1	
						Total Number of Samples to the Laboratory:	**33**	**10**

[1]This table focuses on the December, 2011 Sampling Event. The remaining sampling events (March, 2012; June, 2012; September, 2012; December, 2012; and December, 2013) are identical with the following exceptions:

Subsurface soil samples are not collected (only groundwater samples are collected).

[2]Frequency of Field QA/QC Sample Collection (assuming GW sampling occupies 5 days; decontaminated equipment; samples shipped daily)

Field Duplicate: One per 10 normal field samples
MS/MSD Pair: One pair per 20 normal field samples
Trip Blank: One per cooler containing VOCs samples
Equipment Blank: One per day per equipment type

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4 Data Validation, Management, and Reporting

Data Validation, Review, and Management Tasks:

- Perform internal data validation in accordance with **Worksheets #34, #35, and #36 (Section 2)**.
- Perform a data usability assessment in accordance with **Worksheet #11 (Section 2).**
- Incorporate validated data into the NIRISdatabase, in accordance with the Navy CLEAN Data Management Plan **(Appendix C)**. The laboratory accreditation documentation is included in **Appendix D.**

Documentation and Reporting

- Work and data will be documented in the Quarterly Pilot Study Reports.

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Figures

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 1 - BASE LOCATION MAP.MXD CBOWMAN 10/6/2011 9:04:53 AM

Legend

- Cities
- Rivers and Streams
- Military Installation
- County Boundary

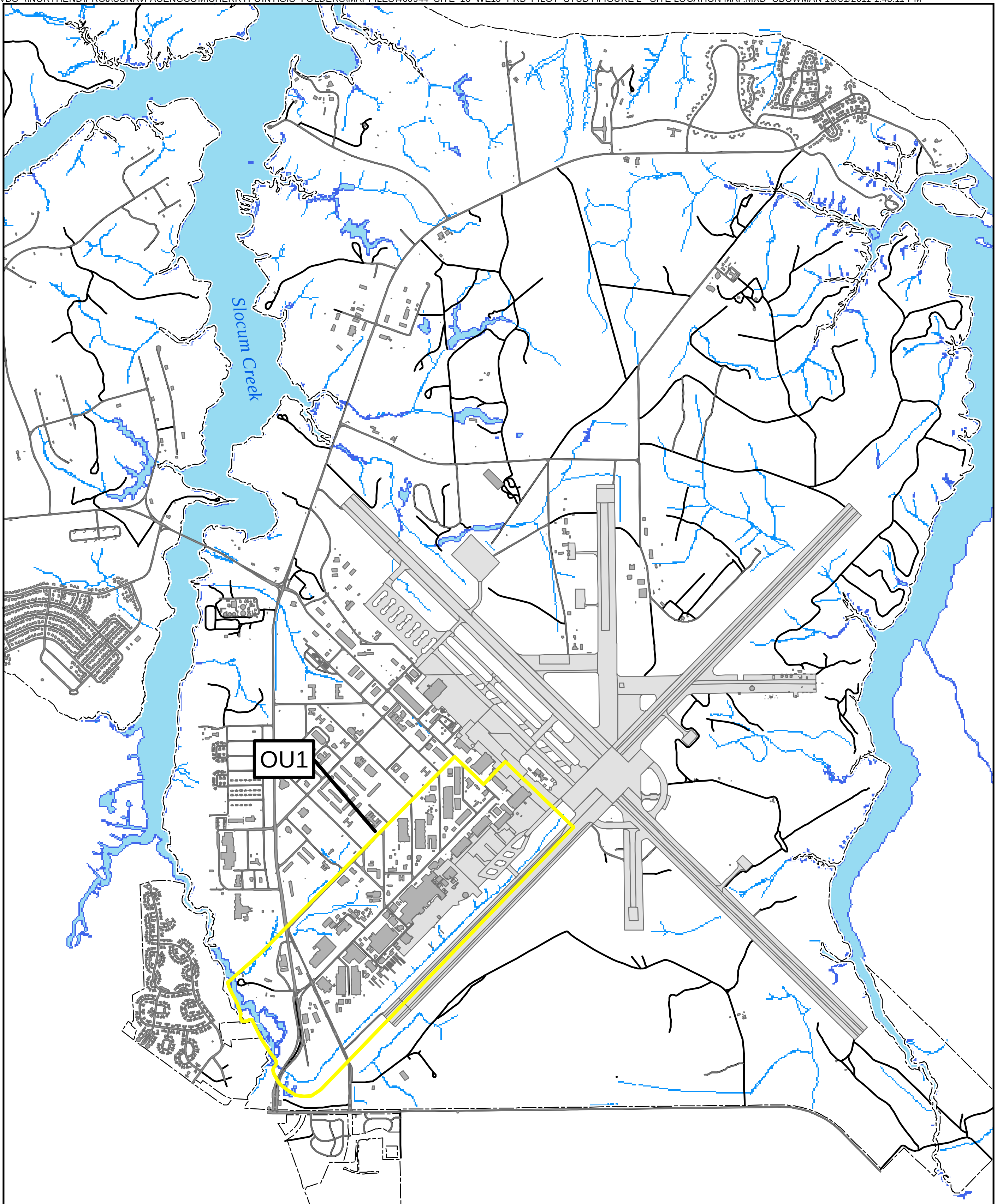
N W E S

0 20,000 40,000 Feet

Figure 1
Base Location Map
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 2 - SITE LOCATION MAP.MXD CBOWMAN 10/31/2011 1:45:11 PM



Legend

- OU Boundary
- Surface Water
- Base Boundary
- Buildings
- Runway
- Road

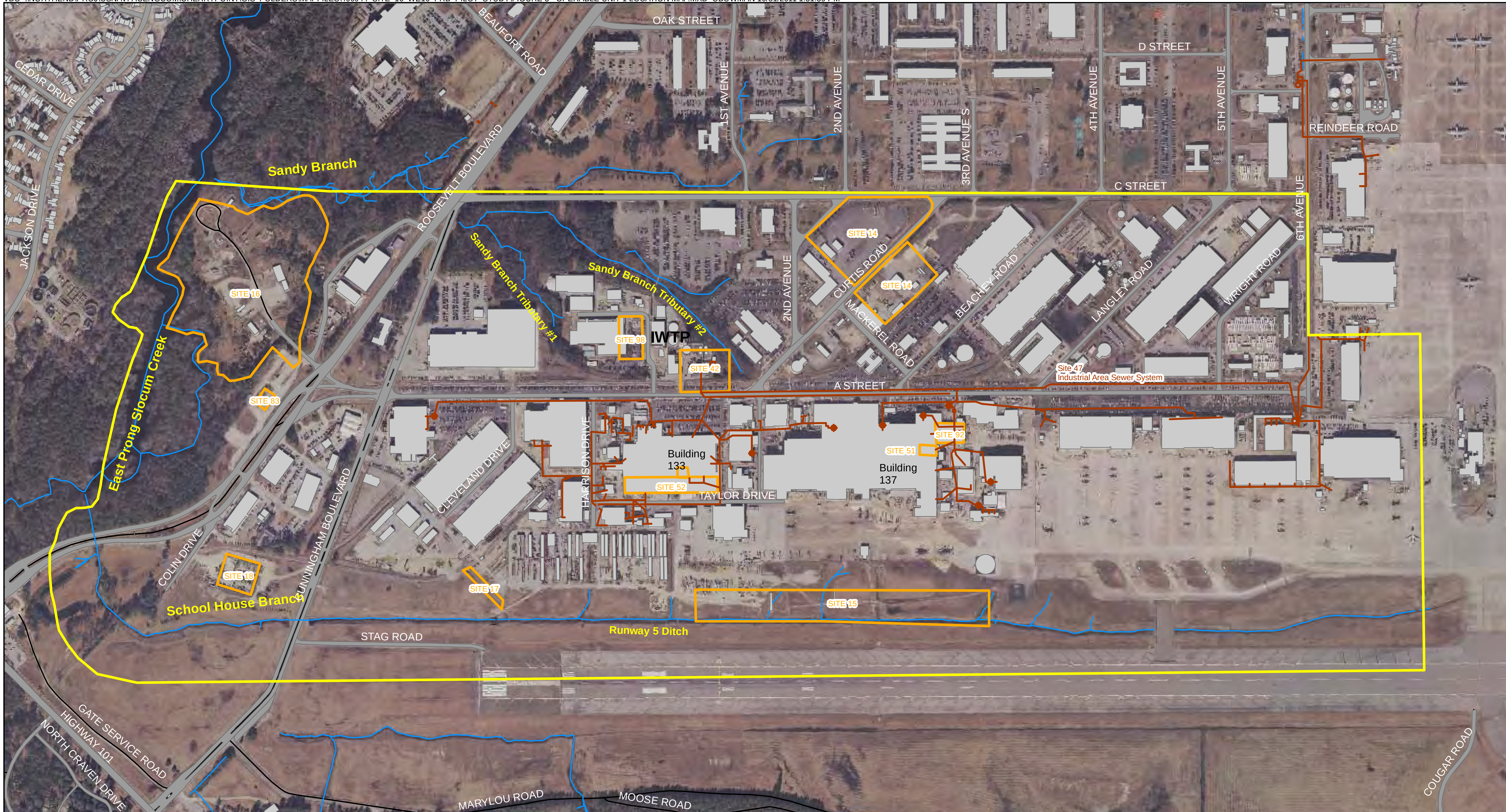
N
W E
S

0 1,500 3,000 Feet

Figure 2
OU1 Location Map
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 3 - OPERABLE UNIT 1 LOCATION MAP.MXD CBOWMAN 10/31/2011 1:31:39 PM



Legend
- Surface Water
- Industrial Area Sewer System
- Site Boundary
- OU1 Boundary
- Existing Buildings

IWTP - Industrial Wastewater Treatment Plant

W N S E

0 600 1,200 Feet

Figure 3
OU1 Sites Location Map
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL.

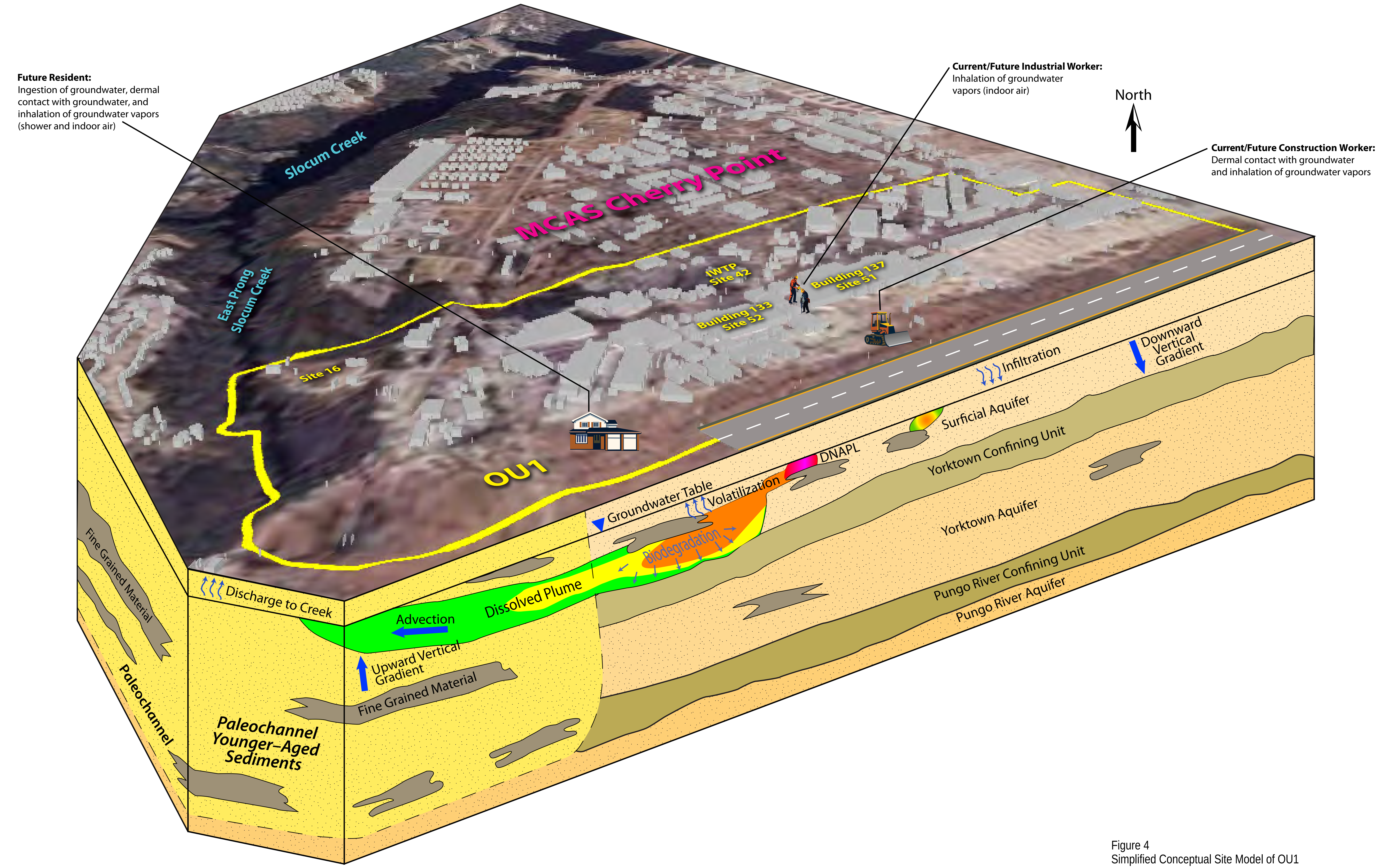
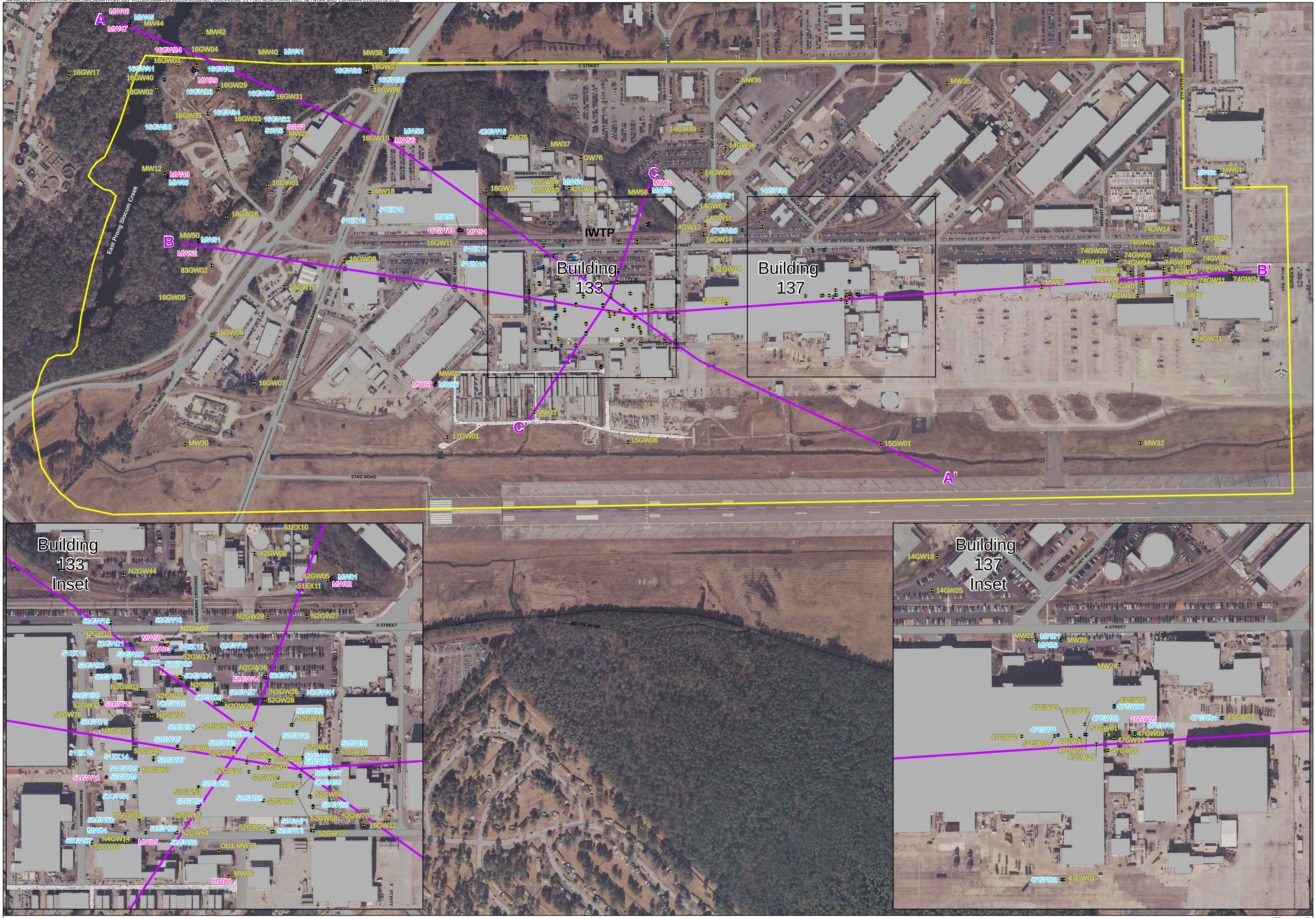


Figure 4
Simplified Conceptual Site Model of OU1
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

\\APHRODITE\PROJ\USNAVYFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\OU1\FS\2009\SECTION2\FIGURE 2-1 - OU1 MONITORING WELL NETWORK.MXD CBOWMAN 1/15/2010 09:35:32



Legend

- Extraction Well
- Upper Surficial Monitoring Well
- Lower Surficial Monitoring Well
- Yorktown Monitoring Well
- Cross Section Transects
- Existing Buildings
- OU1 Boundary
- Paved Road

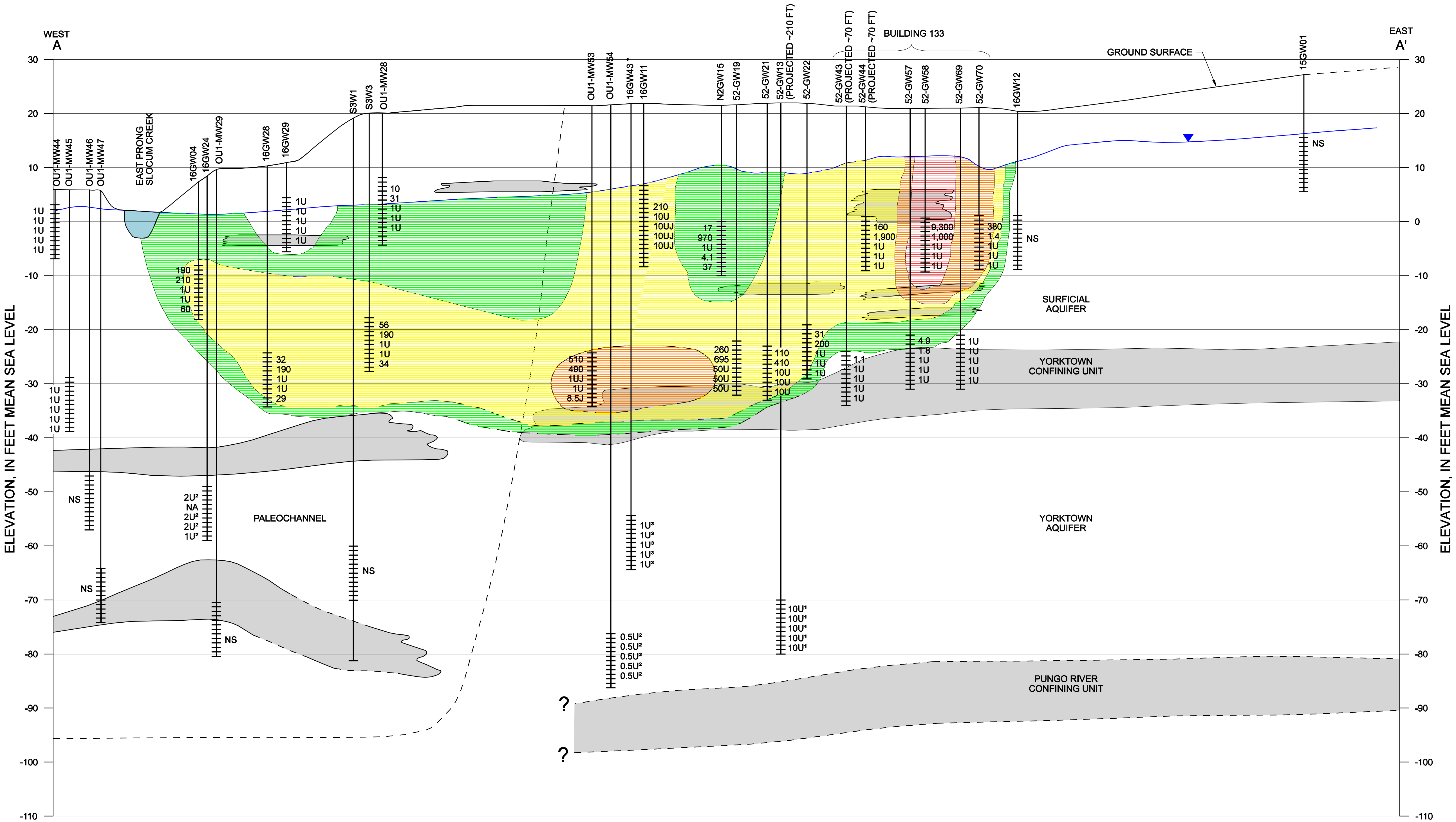
IWTP - Industrial Wastewater Treatment Plant

0 210 420 630 Feet

0 100 200 300 Feet

Figure 5
OU1 Monitoring Well Network and
Location of Hydrogeologic Cross-Sections
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL



LEGEND

WELL SCREEN INTERVAL

LINE OF APPROXIMATELY EQUAL TCE ISOCONCENTRATION IN µg/L

PREDOMINANTLY COARSE-GRAINED MATERIAL

PREDOMINANTLY FINE-GRAINED MATERIAL

TCE ISOCONCENTRATION CONTOURS

3 – 30 µg/L

30 – 300 µg/L

300 – 3,000 µg/L

3,000 – 11,000 µg/L

>11,000 µg/L

NOTES.

ALL ANALYTICAL DATA IS FROM THE SPRING 2009 SAMPLING EVENT UNLESS OTHERWISE NOTED.

1. ANALYTICAL DATA IS FROM THE APRIL AND MAY 2006 SAMPLING EVENT.

2. ANALYTICAL DATA IS FROM EITHER MARCH AND MAY 2005 SAMPLING EVENT.

3. ANALYTICAL DATA IS FROM THE AUGUST 2008 SAMPLING EVENT.

? - PUNGO RIVER CONFINING UNIT NOT DELINEATED IN THE WESTERN PORTION OF THE SITE.

CONCENTRATIONS ARE PRESENTED IN THE FOLLOWING ORDER:

TRICHLOROETHENE (TCE)
1,2 - DICHLOROETHENE (1,2 -DCE)
1,1,1 - TRICHLOROETHANE (1,1,1 -TCA)
1,1 - DICHLOROETHENE (1,1 - DCE)
VINYL CHLORIDE

ALL CONCENTRATIONS ARE IN µg/L

NA = NOT ANALYZED
µg/L = MICROGRAMS PER LITER
NS = NOT SAMPLED
J = ESTIMATED VALUE
NC2L FOR TCE = 3 µg/L (Jan 2010)

VERTICAL SCALE 10 0 300

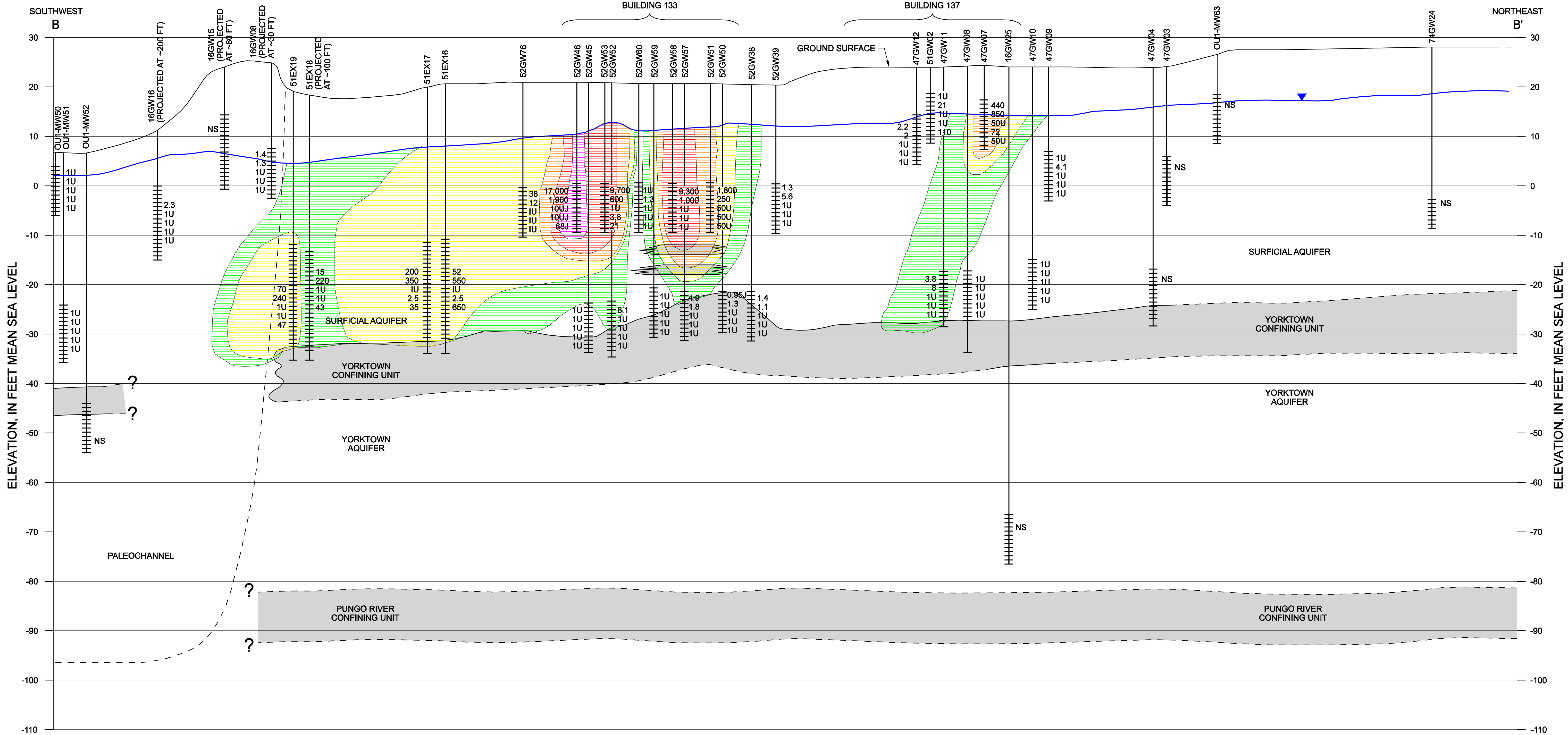
APPROXIMATE HORIZONTAL SCALE (SCALE IN FEET)

VERTICAL EXAGGERATION = 30

Figure 6
VOC Isoconcentrations Cross Section A-A'
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

FILENAME: fn01g004_358454.dgn PLOT DATE: 12/28/2009

CH2MHILL.



LEGEND

WELL SCREEN INTERVAL

LINE OF APPROXIMATELY EQUAL TCE ISOCONCENTRATION IN µg/L

PREDOMINANTLY COARSE-GRAINED MATERIAL

PREDOMINANTLY FINE-GRAINED MATERIAL

TCE ISOCONCENTRATION CONTOURS

- 3 – 30 µg/L
- 30 – 300 µg/L
- 300 – 3,000 µg/L
- 3,000 – 11,000 µg/L
- >11,000 µg/L

ALL ANALYTICAL DATA IS FROM THE APRIL AND MAY 2006 SAMPLING EVENT UNLESS OTHERWISE NOTED.

1. ANALYTICAL DATA IS FROM THE MAY 2005 SAMPLING EVENT.
2. ANALYTICAL DATA IS FROM THE NOVEMBER 2005 SAMPLING EVENT.
3. ANALYTICAL DATA IS FROM THE MARCH 2000 SAMPLING EVENT.

CONCENTRATIONS ARE PRESENTED IN THE FOLLOWING ORDER:
TRICHLOROETHENE (TCE)
1,2 - DICHLOROETHENE (1,2 -DCE)
1,1,1 - TRICHLOROETHANE (1,1,1 -TCA)
1,1 - DICHLOROETHENE (1,1 - DCE)
VINYL CHLORIDE

ALL CONCENTRATIONS ARE IN µg/L

NA = NOT ANALYZED
µg/L = MICROGRAMS PER LITER
NS = NOT SAMPLED
J = ESTIMATED VALUE
NC2L FOR TCE = 3 µg/L (Jan 2010)

? - PUNGO RIVER CONFINING UNIT NOT DELINEATED IN THE WESTERN PORTION OF THE SITE.

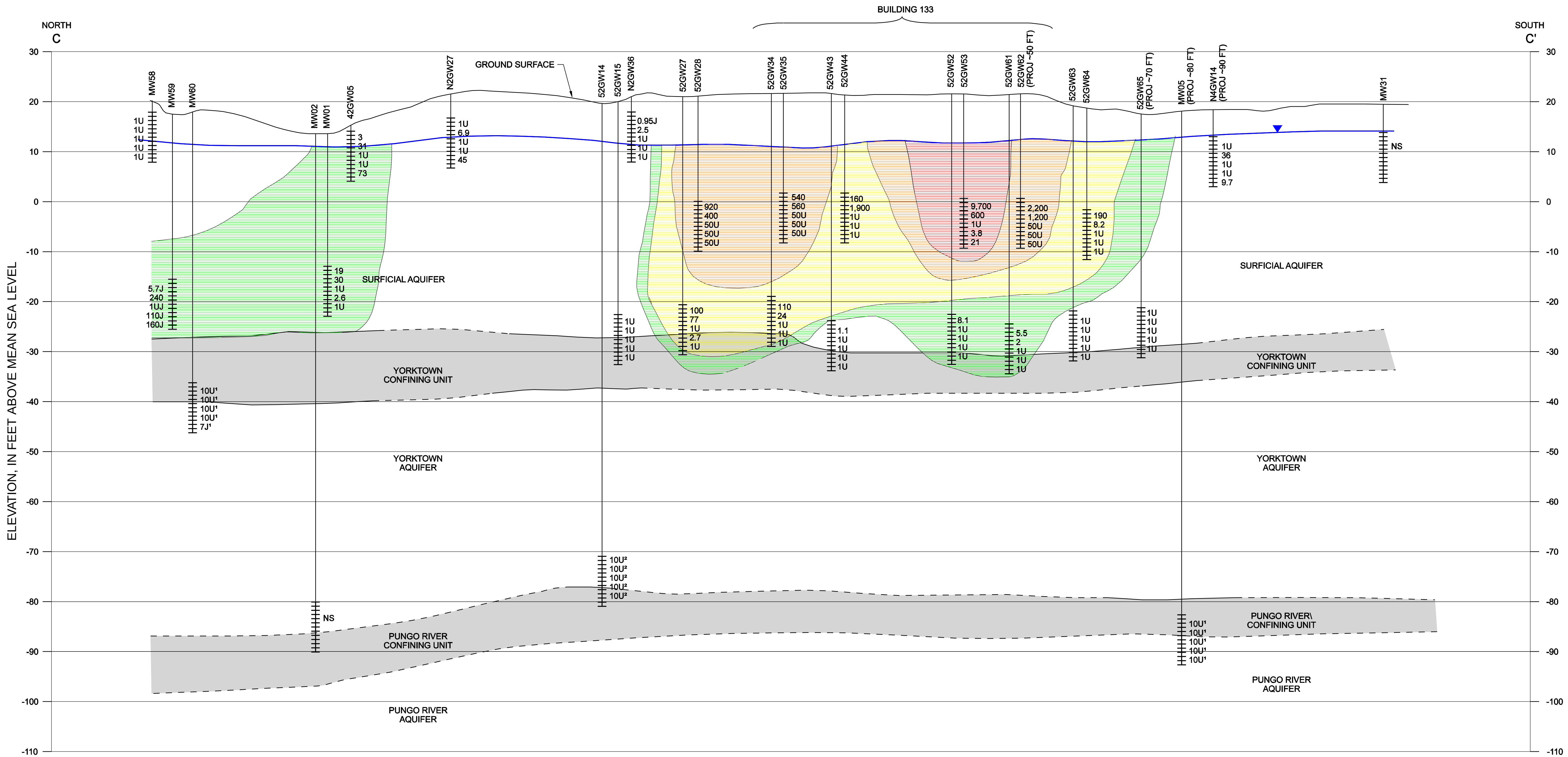
VERTICAL SCALE 0 – 10
APPROXIMATE HORIZONTAL SCALE (SCALE IN FEET) 0 – 300

VERTICAL EXAGGERATION = 30

Figure 7
VOC Isoconcentrations Cross Section B-B'
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL.

FILENAME: fn01g005_358454.dgn PLOT DATE: 12/28/2009



LEGEND

WELL SCREEN INTERVAL

LINE OF APPROXIMATELY EQUAL TCE ISOCONCENTRATION IN ug/L

PREDOMINANTLY COARSE-GRAINED MATERIAL

PREDOMINANTLY FINE-GRAINED MATERIAL

TCE ISOCONCENTRATION CONTOURS

- 3 – 30 μg/L
- 30 – 300 μg/L
- 300 – 3,000 μg/L
- 3,000 – 11,000 μg/L
- >11,000 μg/L

NOTES:

ALL ANALYTICAL DATA ARE FROM THE SPRING 2009 SAMPLING EVENT UNLESS OTHERWISE NOTED.

1. ANALYTICAL DATA ARE FROM APRIL AND MAY 2006 SAMPLING EVENT.
2. ANALYTICAL DATA ARE FROM JUNE 2007 SAMPLING EVENT.

CONCENTRATIONS ARE PRESENTED IN THE FOLLOWING ORDER:

TRICHLOROETHENE (TCE)
1,2 - DICHLOROETHENE (1,2 - DCE)
1,1,1 - TRICHLOROETHANE (1,1,1 - TCA)
1,1 - DICHLOROETHENE (1,1 - DCE)
VINYL CHLORIDE

ALL CONCENTRATIONS ARE IN ug/L

NA = NOT ANALYZED
ug/L = MICROGRAMS PER LITER
NS = NOT SAMPLED
J = ESTIMATED VALUE
NC2L FOR TCE = 3 ug/L

VERTICAL SCALE 10 0 150

APPROXIMATE HORIZONTAL SCALE (SCALE IN FEET)

VERTICAL EXAGGERATION = 15

Figure 8
VOC Isoconcentrations
Cross Section A-A'
Marine Corps Air Station Cherry Point
Cherry Point, NC

CH2MHILL

FILENAME: fn01g006_358454.dgn PLOT DATE: 12/28/2009

\\APHRODITE\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\OU1\FS\2009\SECTION2\FIGURE 2-5 - GW CONTOUR UPPER SURFICIAL.MXD CBOWMAN 12/18/2009 14:04:20

Legend

- Extraction Well
- Monitoring Well
- Groundwater Elevation Contour (ft msl)
- Surface Water
- Operable Unit (OU) Boundary
- Existing Buildings
- Paved

Notes:
1. ft msl - feet (relative to) mean sea level
2. NU - Not used in contouring

0 200 400
Feet

Figure 9
2009 Groundwater Elevation Map
Upper Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

\\APHRODITE\PROJ\NAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\OU1\FS\2009\SECTION2\FIGURE 2-6 - GW CONTOUR LOWER SURFICIAL_MXD CBOWMAN 12/18/2009 14:05:04

Legend

- Extraction Well
- Monitoring Well
- Groundwater Elevation Contour (ft msl)
- Surface Water
- Operable Unit (OU) Boundary
- Existing Buildings
- Paved

Notes:
1. ft msl - feet (relative to) mean sea level
2. NU - Not used in contouring

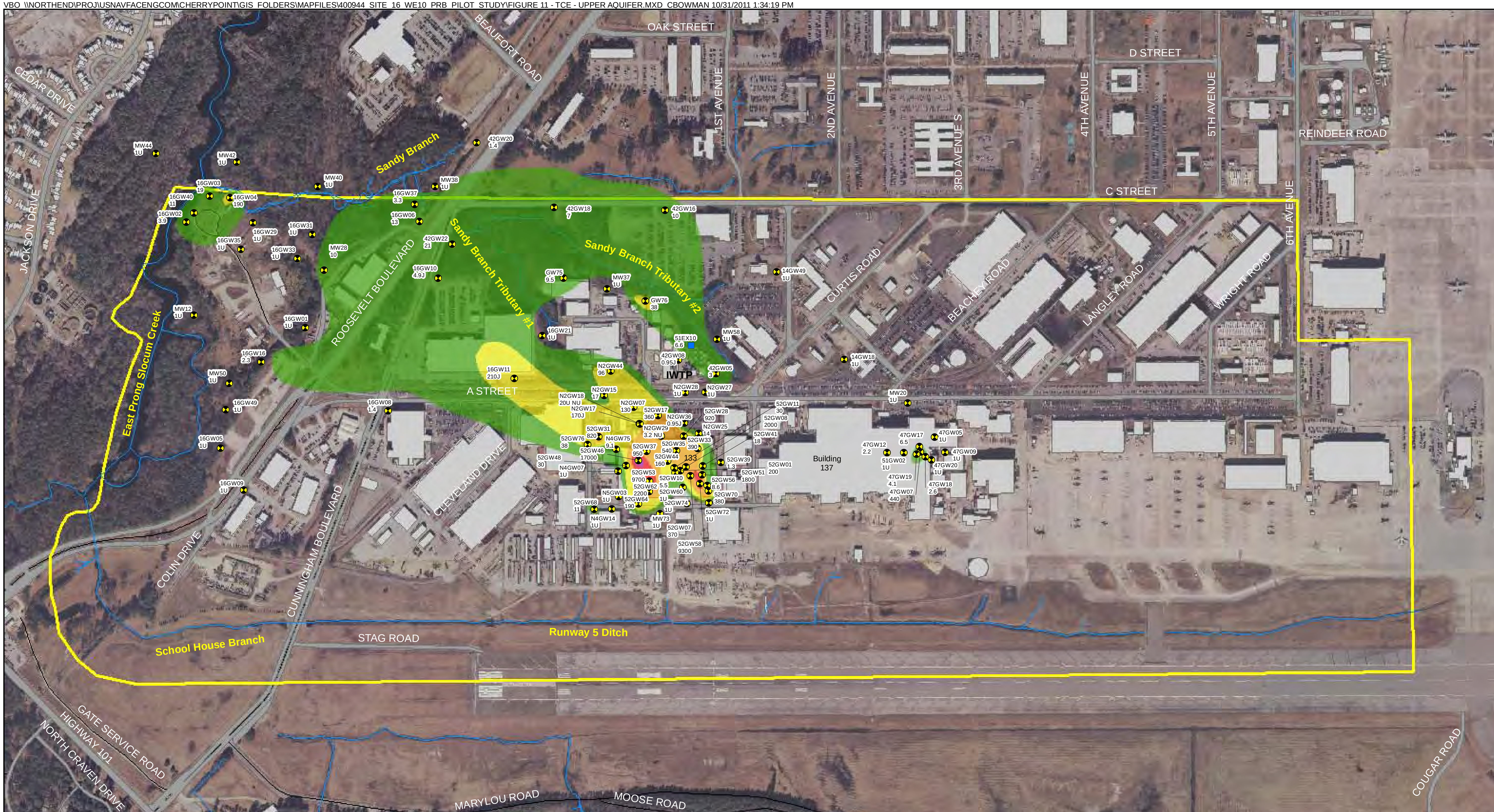
N E S W

0 200 400
Feet

Figure 10
2009 Groundwater Elevation Map
Lower Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 11 - TCE - UPPER AQUIFER.MXD CBOWMAN 10/31/2011 1:34:19 PM



Legend

- Extraction Well
- Monitoring Well - Upper Aquifer
- Surface Water
- OU1 Boundary
- Existing Buildings
- 3 - 30 µg/L
- 30 - 300 µg/L
- 300 - 3,000 µg/L
- 3,000 - 11,000 µg/L
- > 11,000 µg/L

IWTP - Industrial Wastewater Treatment Plant

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 3 µg/L (Jan 2010)
NU = Not Used
Concentrations are from the Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

W N S E

0 600 1,200 Feet

Figure 11
TCE Isoconcentration Map
Upper Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 12 - TCE - LOWER AQUIFER.MXD CBOWMAN 10/31/2011 1:48:33 PM

Legend

- Extraction Well
- Monitoring Well - Lower Aquifer
- Surface Water
- OU1 Boundary
- Existing Buildings
- 3 - 30 µg/L
- 30 - 300 µg/L
- 300 - 3,000 µg/L

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 3 µg/L (Jan 2010)
NU = Not Used
Concentrations are from Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

W N S E

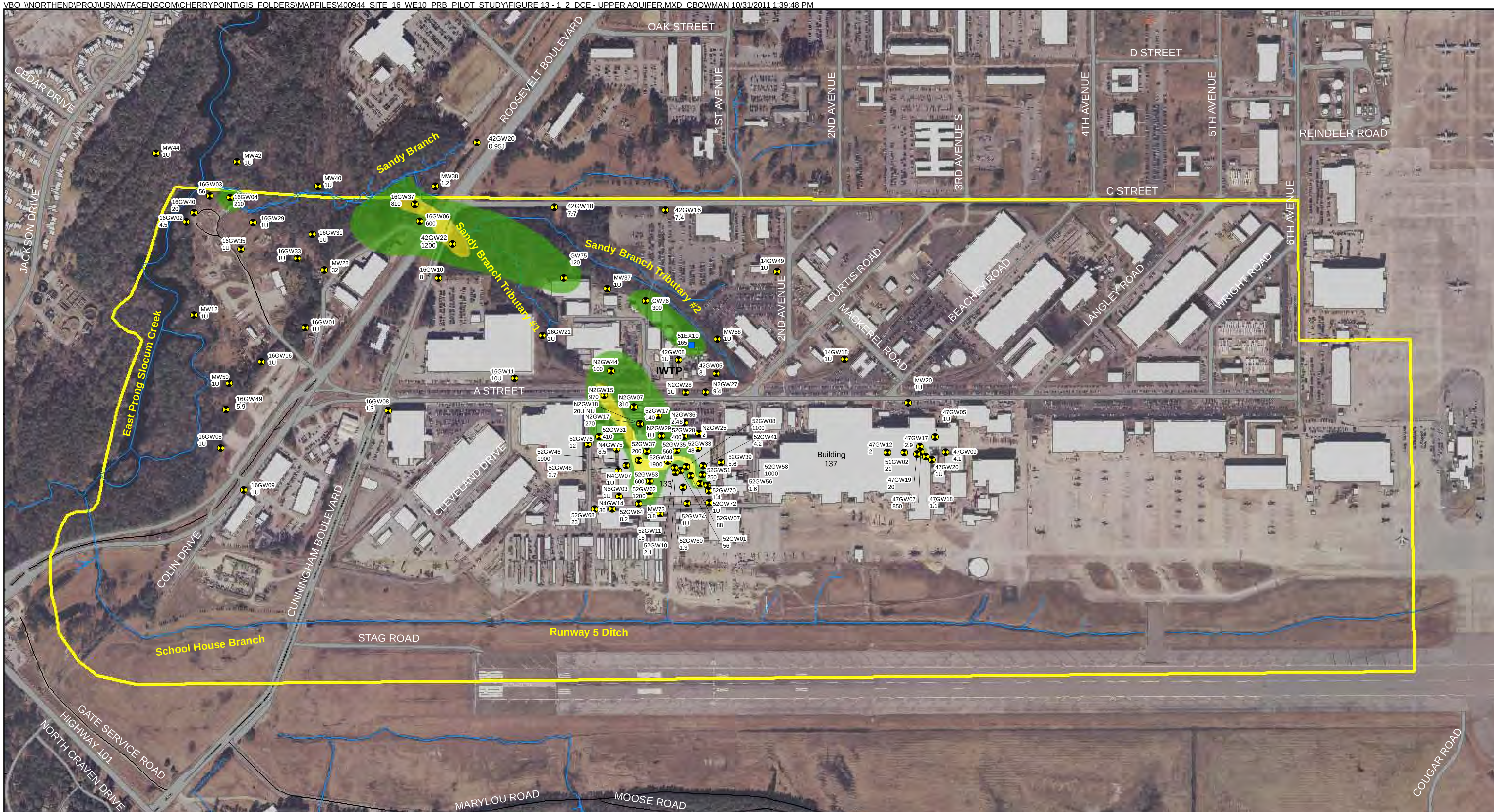
0 600 1,200 Feet

Figure 12
TCE Isoconcentration Map
Lower Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

IWTP - Industrial Wastewater Treatment Plant

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS FOLDERS\MAPFILES\400944 SITE 16 WE10 PRB PILOT STUDY\FIGURE 13 - 1 2 DCE - UPPER AQUIFER.MXD CBOWMAN 10/31/2011 1:39:48 PM



Legend

- Extraction Well
- Monitoring Well
- Surface Water
- OU1 Boundary
- Existing Buildings
- 70 - 700 µg/L
- 700 - 7,000 µg/L

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 70 µg/L (Jan 2010)
NU = Not Used
Concentrations are from the Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

W N S E

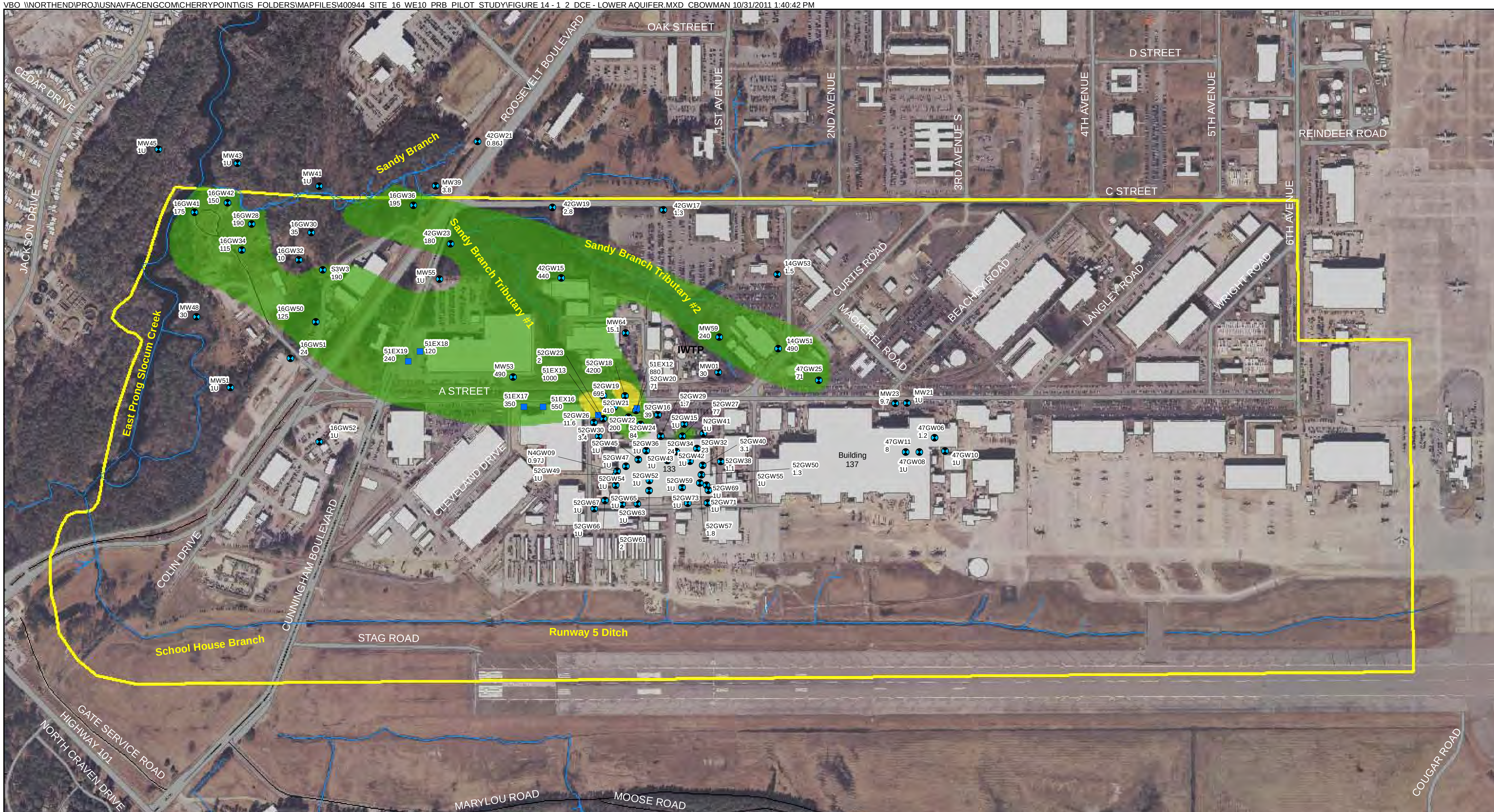
0 600 1,200 Feet

Figure 13
1,2 DCE Isoconcentration Map
Upper Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

IWTP - Industrial Wastewater Treatment Plant

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 14 - 1_2_DCE - LOWER AQUIFER.MXD CBOWMAN 10/31/2011 1:40:42 PM



Legend

- Extraction Well
- Monitoring Well
- Surface Water
- OU1 Boundary
- Existing Buildings
- 70 - 700 µg/L
- 700 - 7,000 µg/L

IWTP - Industrial Wastewater Treatment Plant

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 70 µg/L (Jan 2010)
NU = Not Used
Concentrations are from the Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

0 600 1,200 Feet

Figure 14
1,2 DCE Isoconcentration Map
Lower Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 15 - VC - UPPER AQUIFER.MXD CBOWMAN 10/31/2011 1:41:42 PM

Legend

- Extraction Well
- Monitoring Well - Upper Aquifer
- Surface Water
- OU1 Boundary
- Existing Buildings
- 0.03 - 30 µg/L
- 30 - 300 µg/L
- 300 - 3,000 µg/L

IWTP - Industrial Wastewater Treatment Plant

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 0.03 µg/L (Jan 2010)
NU = Not Used
Concentrations are from the Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

W N S E

0 600 1,200 Feet

Figure 15
VC Isoconcentration Map
Upper Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 16 - VC - LOWER AQUIFER.MXD CBOWMAN 10/31/2011 1:42:11 PM

Legend

- ■ Extraction Well
- ● Monitoring Well - Lower Aquifer
- Surface Water
- OU1 Boundary
- Existing Buildings
- 0.03 - 30 µg/L
- 30 - 300 µg/L
- 300 - 3,000 µg/L

IWTP - Industrial Wastewater Treatment Plant

Notes:
NC2L - North Carolina Groundwater Standard
NC2L = 0.03 µg/L (Jan 2010)
NU = Not Used
Concentrations are from the Spring 2009 sampling event
µg/L = micrograms per liter
U - analyte not detected above detection limit
J - concentration is estimated

W N S E

0 600 1,200 Feet

Figure 16
VC Isoconcentration Map
Lower Surficial Aquifer
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHERRYPOINT\GIS_FOLDERS\MAPFILES\400944_SITE_16_WE10_PRB_PILOT_STUDY\FIGURE 17 - SITE 16 SAMPLE LOCATIONS.MXD CBOWMAN 3/26/2012 3:29:43 PM

Legend

- Proposed Grain Size Analysis Location
- Proposed Upper Surficial Aquifer Monitoring Well
- Proposed Lower Surficial Aquifer Monitoring Well
- Proposed Upper Yorktown Aquifer Monitoring Well
- Upper Surficial Aquifer Monitoring Well
- Lower Surficial Aquifer Monitoring Well
- Upper Yorktown Aquifer Monitoring Well
- Proposed ZVI/Sand PRB
- Site 16 Boundary

N
W E
S

0 70 140
Feet

Figure 17
Sampling Location Map
Marine Corps Air Station Cherry Point
Cherry Point, North Carolina

CH2MHILL

Appendix A
Laboratory Specific Information

A-1 Reference Limits and Evaluation Tables

Matrix: Groundwater and Aqueous (Blanks)
Analytical Group: VOC
(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15-1)

Analyte[3]	CAS No.	NCGWQS (ug/L)	MCLs (ug/L)	Project QL Goal[2] (ug/L)	Laboratory Specific Limits (ug/L)		
					LOQs	LODs	DLs
1,1,1-Trichloroethane	71-55-6	200	200	100	1.0	0.28	0.14
1,1,2,2-Tetrachloroethane	79-34-5	0.2	NC[1]	0.2	1.0	0.20	0.10
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	76-13-1	200000	NC[1]	100000	1.0	0.42	0.21
1,1,2-Trichloroethane	79-00-5	NC[1]	5	2.5	1.0	0.40	0.20
1,1-Dichloroethane	75-34-3	6	NC[1]	3	1.0	0.38	0.19
1,1-Dichloroethene	75-35-4	7	7	3.5	1.0	0.60	0.30
1,2,3-Trichlorobenzene	87-61-6	NC[1]	NC[1]	1.0	1.0	0.58	0.29
1,2,4-Trichlorobenzene	120-82-1	70	70	35	1.0	0.42	0.21
1,2-Dibromo-3-chloropropane	96-12-8	0.04	0.2	0.04	2.0	1.5	0.76
1,2-Dibromoethane	106-93-4	0.02	0.05	0.02	1.0	0.40	0.20
1,2-Dichlorobenzene	95-50-1	20	600	10	1.0	0.34	0.17
1,2-Dichloroethane	107-06-2	0.4	5	0.4	1.0	0.28	0.14
1,2-Dichloropropane	78-87-5	0.6	5	0.6	1.0	0.34	0.17
1,3-Dichlorobenzene	541-73-1	200	NC[1]	100	1.0	0.22	0.11
1,4-Dichlorobenzene	106-46-7	6	75	3	1.0	0.38	0.19
2-Butanone	78-93-3	4000	NC[1]	2000	10	1.2	0.60
2-Hexanone	591-78-6	NC[1]	NC[1]	10	10	1.8	0.92
4-Methyl-2-pentanone	108-10-1	NC[1]	NC[1]	10	10	3.8	1.9
Acetone	67-64-1	6000	NC[1]	3000	10	1.9	0.95
Benzene	71-43-2	1	5	0.5	1.0	0.32	0.16
Bromochloromethane	74-97-5	NC[1]	NC[1]	1.0	1.0	0.30	0.15
Bromodichloromethane	75-27-4	0.6	80	0.3	1.0	0.28	0.14
Bromoform	75-25-2	4	80	2	1.0	0.28	0.14
Bromomethane	74-83-9	NC[1]	NC[1]	2.0	2.0	0.48	0.24
Carbon disulfide	75-15-0	700	NC[1]	350	1.0	0.40	0.20
Carbon tetrachloride	56-23-5	0.3	5	0.3	1.0	0.20	0.10
Chlorobenzene	108-90-7	50	100	25	1.0	0.42	0.21
Chloroethane	75-00-3	3000	NC[1]	1500	1.0	0.42	0.21

Analyte[3]	CAS No.	NCGWQS (ug/L)	MCLs (ug/L)	Project QL Goal[2] (ug/L)	Laboratory Specific Limits (ug/L)		
					LOQs	LODs	DLs
Chloroform	67-66-3	70	80	35	1.0	0.14	0.070
Chloromethane	74-87-3	3	NC[1]	1.5	1.0	0.62	0.31
cis-1,2-Dichloroethene	156-59-2	70	70	35	1.0	0.32	0.16
cis-1,3-Dichloropropene	10061-01-5	0.4	NC[1]	0.4	1.0	0.30	0.15
Cyclohexane	110-82-7	NC[1]	NC[1]	1.0	1.0	0.28	0.14
Dibromochloromethane	124-48-1	0.4	80	0.4	0.4	0.38	0.19
Dichlorodifluoromethane (Freon-12)	75-71-8	1000	NC[1]	500	1.0	0.38	0.19
Ethylbenzene	100-41-4	600	700	300	1.0	0.46	0.23
Isopropylbenzene	98-82-8	70	NC[1]	35	1.0	0.32	0.16
Methyl acetate	79-20-9	NC[1]	NC[1]	1.0	1.0	0.78	0.39
Methylcyclohexane	108-87-2	NC[1]	NC[1]	1.0	1.0	0.22	0.11
Methylene chloride	75-09-2	5	5	2.5	5.0	0.70	0.35
Methyl-tert-butyl ether (MTBE)	1634-04-4	20	NC[1]	10	1.0	0.38	0.19
Styrene	100-42-5	70	100	35	1.0	0.50	0.25
Tetrachloroethene	127-18-4	0.7	5	0.35	1.0	0.30	0.15
Toluene	108-88-3	600	1000	300	1.0	0.34	0.17
trans-1,2-Dichloroethene	156-60-5	100	100	50	1.0	0.38	0.19
trans-1,3-Dichloropropene	10061-02-6	0.4	NC[1]	0.4	1.0	0.36	0.18
Trichloroethene	79-01-6	3	5	1.5	1.0	0.32	0.16
Trichlorofluoromethane(Freon-11)	75-69-4	2000	NC[1]	1000	1.0	0.48	0.24
Vinyl chloride	75-01-4	0.03	2	0.03	1.0	0.46	0.23
Xylene, total	1330-20-7	500	10000	250	1.0	0.38	0.19
	Shading indicates cells where the LOD is greater than the screening level.						

[1]NC: No Screening level for this compound.

[2]The Project QL Goal is 1/2 the minimum of NCGWQS and 'MCLs', the minimum of ' NCGWQS and 'MCLs', or the LOQ, as applicable.

[3]Analyte list is TCL VOCs from EPA Contract Laboratory Program (CLP) OLC03.2 .

A-2 Reference Limits and Evaluation Tables

(UFP-QAPP Manual Section 2.8.1 – Worksheet # 15-2)

Matrix: Subsurface Soil
Analytical Group: GRAINSIZE

***Analyte*[2]**	***CAS No.*[3]**	***Project QL Goal*[1] *(ug/L)***	***Report Units*[4]**
GS09 Sieve 0.5" (12.5 mm)	*SIEVE12.5*	*N/A*	*PCT_P*
GS10 Sieve 0.375" (9.5 mm)	*SIEVE9.5*	*N/A*	*PCT_P*
Sieve No. 004 (4.75 mm)	*SIEVE4.75*	*N/A*	*PCT_P*
Sieve No. 010 (2.00 mm)	*SIEVE2.0*	*N/A*	*PCT_P*
Sieve No. 020 (850 um)	*SIEVE850*	*N/A*	*PCT_P*
Sieve No. 040 (425 um)	*SIEVE425*	*N/A*	*PCT_P*
Sieve No. 060 (250 um)	*SIEVE250*	*N/A*	*PCT_P*
Sieve No. 080 (180 um)	*SIEVE180*	*N/A*	*PCT_P*
Sieve No. 100 (150 um)	*SIEVE150*	*N/A*	*PCT_P*
Sieve No. 200 (75um)	*SIEVE75*	*N/A*	*PCT_P*
Gravel (%)	*GRAVEL*	*N/A*	*PCT*
Sand (%)	*14808-60-7*	*N/A*	*PCT*
Coarse Sand (%)	*COARSESAND*	*N/A*	*PCT*
Medium Sand (%)	*MEDIUMSAND*	*N/A*	*PCT*
Fine Sand (%)	*FINESAND*	*N/A*	*PCT*
Fines (%)	*FINES*	*N/A*	*PCT*

[1]There are no Project QL Goals because there are no project indicator limits for GRAINSIZE.
[2]This is a typical sieve set. A similar sieve set is also acceptable.
Sieve No. 010 marks the gravel to coarse sand line.
Sieve No. 030 (interpolated) marks the coarse sand to medium sand line.
Sieve No. 040 marks the medium sand to fine sand line.
Sieve No. 200 marks the fine sand to silt line.
Sand (%) is the sum percentage of coarse sand, medium sand, and fine sand.
Fines (%) is that which is not retained by Sieve No. 200; typically, this is the sum of silt and clay.
[3]Some CAS numbers are contractor-specific.
[4]PCT_P: Percent Passing; PCT: Percent

A-3 Analytical SOP References Table

(UFP-QAPP Manual Section 3.2.1 – Worksheet #23)

APPL, Inc.
908 North Temperance Ave.
Clovis, CA 93611
POC: Cynthia Clark
(559) 275-2175

Lab SOP Number	Title, Revision Date, and Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Variance to Quality Systems Manual (QSM)	Modified for Project Work
SHR001	Receiving Samples, 3/1/11, Rev. 37	N/A	All	N/A	N/A	N
ANA8260B	Analysis of Water/Soil/Sludge by EPA Method 8260B, 9/12/11, Rev. 28	Definitive	GW / VOC	Gas Chromatograph/Mass Spectrometer (GC-MS)	None[1]	N
N/A	An SOP is not needed for GRAINSIZE analysis which is used as per ASTM D422 to generate screening data.	Screening	SB / GRAINSIZE	Sieve Set	N/A	N

[1]As of 9/14/11, APPL is Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) accredited for all TCL VOCs except cyclohexane, methyl acetate, and methylcyclohexane. These compounds shall be added to the laboratory's DoD ELAP letter prior to fieldwork (**Appendix D**).

A-4 Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4 – Worksheet #28-1)

Matrix: Groundwater and Aqueous (Blanks)
Analysis Group: VOC
Analysis Method / SOP Reference: SW-846 8260B / ANA8260B

QC Sample	Frequency and Number	Method/SOP QC Acceptance Limits[1]	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Internal Standards Verification	Every field sample, standard, and QC sample.	Retention time ±30 seconds from retention time of the midpoint standard in the initial calibration (ICAL); EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If CA fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards. Sample results are not acceptable without a valid IS verification.	Analyst	Accuracy	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL; EICP area within -50% to +100% of ICAL midpoint standard.
Method Blank	One per preparatory batch.	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v. 4.1).	Correct problem, then see criteria in Box D-1 of DoD QSM v. 4.1 . If required, reprep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Problem must be corrected. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst	Contamination	No analytes detected > 1/2 RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL (see Box D-1 of DoD QSM v. 4.1).
Laboratory Control Sample (LCS) containing all analytes to be reported, including surrogates	One per preparatory batch.	Limits are as per DoD QSM v. 4.1 Table G-4. Laboratory in-house limits are used when DoD QSM limits are not available.	Correct problem then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch. Problem must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst	Accuracy	Limits are as per DoD QSM v. 4.1 Table G-4. Laboratory in-house limits are used when DoD QSM limits are not available.
Matrix Spike (MS)	One per preparatory batch per matrix	Same as for LCS	Examine the project-specific DQOs. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst	Accuracy	Same as for LCS
Matrix Spike Duplicate (MSD) or Laboratory Replicate	One per preparatory batch per matrix	Same as for LCS.	Same as MS.	Analyst	Accuracy / Precision	Same as for LCS.
Surrogate Spike	All field and QC samples	1,2-Dichloroethane-d4: 70-120% 4-Bromofluorobenzene: 75-120% Dibromofluoromethane: 85-115% Toluene-d8: 85-120% Limits are as per DoD QSM v. 4.1 Table G-3.	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary. Apply Q-flag to all associated analytes if acceptance criteria are not met.	Analyst	Accuracy	1,2-Dichloroethane-d4: 70-120% 4-Bromofluorobenzene: 75-120% Dibromofluoromethane: 85-115% Toluene-d8: 85-120% Limits are as per DoD QSM v. 4.1 Table G-3.
Results reported between DL and LOQ	N/A	Apply J-flag to all results between DL and LOQ.	N/A	Analyst	Accuracy	N/A

[1]DoD QSM v. 4.1 is the basis for specifications on this table.

A-5 Laboratory QC Samples Table

(UFP-QAPP Manual Section 3.4 – Worksheet #28-2)

Matrix: Subsurface Soil
Analysis Group: GRAINSIZE
Analysis Method / SOP Reference: ASTM D422 / N/A

QC Sample	Frequency and Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
N/A: Laboratory QC samples are not planned for grain size (sieve) analysis.						

Appendix B
Field Standard Operating Procedures

Preparing Field Log Books

I. Purpose

This SOP provides general guidelines for entering field data into log books during site investigation and remediation activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement for much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. PROCEDURES FOR COMPLETING FIELD LOG BOOKS

1. Field notes commonly are kept in bound, hard-cover logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.

2. On the inside cover of the log book the following information should be included:

   - Company name and address
   - Log-holders name if log book was assigned specifically to that person

- Activity or location
- Project name
- Project manager’s name
- Phone numbers of the company, supervisors, emergency response, etc.

3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used should be marked through with a line, the author’s initials, the date, and the note “Intentionally Left Blank.”

4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.

5. Daily entries will be made chronologically.

6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.

7. Each page of the log book will have the date of the work and the note takers initials.

8. The final page of each day’s notes will include the note-takers signature as well as the date.

9. Only information relevant to the subject project will be added to the log book.

10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. INFORMATION TO BE INCLUDED IN FIELD LOG BOOKS

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector’s memory. Entries must be legible and complete.

2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.

3. Scope: Describe the general scope of work to be performed each day.

4. Weather: Record the weather conditions and any significant changes in the weather during the day.

5. Tail Gate Safety Meetings: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/ problems, and other pertinent information.

6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.

7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.

8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.

9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.

10. Time: Keep a running time log explaining field activities as they occur chronologically throughout the day.

11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.

12. Heath and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.

13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.

14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.

15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.

16. Any conditions that might adversely affect the work or any data obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).

17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:

    - Description of the general sampling area – site name, buildings and streets in the area, etc.
    - Station/Location identifier
    - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
    - Sample matrix and type
    - Sample date and time
    - Sample identifier
    - Draw a box around the sample ID so that it stands out in the field notes
    - Information on how the sample was collected – distinguish between "grab," "composite," and "discrete" samples
    - Number and type of sample containers collected
    - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
    - Parameters to be analyzed for, if appropriate
    - Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. SUGGESTED FORMAT FOR RECORDING FIELD DATA

1. Use the left side border to record times and the remainder of the page to record information (see attached example).

2. Use tables to record sampling information and field data from multiple samples.

3. Sketch sampling locations and other pertinent information.

4. Sketch well construction diagrams.

V. Attachments

Example field notes.

47 MAY 12, 2003 EXAMPLE

0715 ARRIVE ON SITE AT XYZ SITE.
CH2M HILL STAFF:
John Smith : FIELD TEAM LEADER
Bob Builder: SITE SAFETY COORD.
WEATHER: OVERCAST + Cool, 45°F
CHANCE OF LATE SHOWERS
SCOPE: • Collect GROUNDWATER
SAMPLES for LTM work at SITE 14
• SUPERVISE SURVEY CREW
AT SITE 17
0725 BB ~~Car~~ (JS) Calibrates
PID: 101 ppm/100 ppm OK
PID Model #, SERIAL #
0730 BB Calibrates HORIBA METER
MODEL #, SERIAL #
→ List calibration RESULTS
0738 Survey CREW ARRIVES on Site
→ List NAMES
0745 BB Holds H+S TALK on Slips,
Trips, Falls, Ticks + AIR Monitoring
JS + Survey CREW ATTEND
No H+S ISSUES IDENTIFIED as
CONCERNS. All work is in "Level D."
0755 JS Conducts SITE-WIDE AIR Monitoring
All readings = 0.0 ppm in

JS
5-12-03

MAY 12, 2003 EXAMPLE 48

SITE 14 LTM
BREATHING ZONE (BZ)
0805 Mobilize to well MW-22 to
SAMPLE, surveyors setting up
At SITE 17
0815 PM (PAUL PAPER PUSHER) CALLS AND
INFORMS JS to collect GW SAMPLE
At well MW-44 today for 24 hour
TAT ANALYSIS OF VOC'S
0820 Purging MW-22
→ RECORD WATER QUALITY DATA
JS
5-12-03
0843 Collect SAMPLE At MW-22 for
total TAL Metals AND VOC'S. No
Dissolved Metals Needed PER PM.
0905 JS + BB Mobilize to site 17 to
show surveyors wells to survey.
0942 Mobilize to well MW-22 to
collect SAMPLE.
0950 CAN not ACCESS Well MW-22
due to BASE OPERATIONS; Contact
PAUL PAPER PUSHER AND HE STATED
HE will check on GAINING ACCESS
with BASE contact.
0955 Mobilize to well MW-19

JS
5-12-03

Standard Operating Procedure - 002

Locating and Clearing Underground Utilities

I. Purpose

The purpose of this SOP is to provide general guidelines and specific procedures that must be followed on Navy CLEAN projects for locating underground utilities and clearing dig locations in order to maximize our ability to avoid hitting underground utilities and to minimize liabilities to CH2M HILL and its subcontractors and health and safety risks to our project staff.

This SOP shall be used by Activity Managers and Project Managers to, in-turn, develop Activity-specific and project-specific utility location procedures. The activity and project-specific procedures will become part of work plans and project instructions and will be used to prepare scopes of work (SOWs) for the procurement of utility location subcontractors to meet the needs of individual projects.

This SOP also identifies the types of utility locating services that are available from subcontractors and the various tools that are used to locate utilities, and discusses when each type of service and tool may or may not be applicable.

II. Scope

Depending on the Navy/Marine Activity we typically find ourselves in one of two scenarios:

Scenario 1

The Activity provides utility locating (or dig clearance) services through the public works department or similar organization, or has a contract with an outside utility clearance service. Some of these services are provided in the form of dig permits which are required before you can dig or drill. In other cases no official permit is required and the process is somewhat vague.

Scenario 2

The Activity does not get involved in any utility locating processes aside from possibly providing the most recent utility maps, and relies on CH2M HILL to clear the dig locations.

Table 1 provides an up to date summary of which scenarios apply to the various primary Activities served under the Navy CLEAN program.

Scenario 1 is preferred because under this scenario the Navy tends to assume the responsibility if the location is improperly cleared, a utility is struck, and property damage results. However, our experience has been that the clearance services provided by the Navy do not meet the standards that we consider to be adequate, in that they often simply rely on available base maps to mark utilities and do not verify locations using field geophysics. And if they do use locating tools, they do not provide adequate documentation or marking to confirm that a location has been cleared. So while the Navy's process may protect us from liability for property damage, it does not adequately protect our staff and subcontractors from health risks nor does it compensate us for down time, should a utility be hit.

Therefore, regardless of what services the Navy provides, in most cases we still need to supplement this effort with clearance services from our own third party utility location subcontractor following the procedures and guideline outlined in Section IV of this SOP. The cost implications of providing this service will range from $500 to several $1,000 depending on the size of the project.

The scope of services that we ask our subcontractors to provide can involve utility marking/mapping or the clearing of individual dig locations. In the former we ask our subs to mark all utilities within a "site" and often ask them to prepare a map based on their work. In the later, we ask them to clear (identify if there are any utilities within) a certain radius of a proposed dig/drill location.

The appropriate requested scope of services for a project will depend on the project. Clearing individual boreholes is often less expensive and allows the sub to concentrate their efforts on a limited area. However if the scope of the investigation is fluid (all borehole locations are not predetermined) it may be best to mark and map an entire site or keep the subcontractor on call.

Clearance of individual dig locations should be done to a minimum 20 foot radius around the location.

An example SOW for a utility subcontractor procurement is provided in Attachment A.

III. Services and Equipment

This section provides a general description of the services available to help us locate subsurface utilities and describes the types of equipment that these services may (or may not) use to perform their work. It identifies the capabilities of each type of equipment to help the PM specify what they should require from our utility location subs.

Services

The services that are available to us for identifying and marking underground utilities are:

- The local public/private utility-run service such as Miss Utility
- Utility location subcontractors (hired by us)

Attachment B provides a detailed description of each type of organization. It also provides contact numbers and web sites for the various Miss-Utility-type organizations in the areas where we do work for the Navy and contacts and services provided by several subcontractors that we have used or spoken to in the past.

Equipment

Attachment C provides a summary of the various types of equipment used for subsurface utility location. It describes the capabilities and limitations of each in order to help the PM determine if the equipment being used by a subcontractor is adequate.

It is important to make the potential subcontractors aware of the possible types of utilities (and utility materials) that are at the site, and to have them explain in their bid what types of equipment they will use to locate utilities /clear dig locations, and what the limitations of these equipment are.

A list of in-house experts that can be used to help you evaluate bids or answer questions you may have is provided in Appendix C.

IV. Procedures and Guidelines

This section presents specific procedures to be followed for the utility location work to be conducted by CH2M HILL and our subcontractors. In addition, a PM will have to follow the procedures required by the Activity to obtain their approvals, clearances and dig permits where necessary. These "dig permit" requirements vary by Activity and must be added to the project-specific SOP, or project instructions. It is preferable that the Activity perform their clearance processes before we follow up with our clearance work.

Activity Notification and Dig Permit Procedures

Identify Activity-specific permit and/or procedural requirements for excavation and drilling activities. Contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Activity Specific: To be provided by Activity or Project Manager

CH2M HILL Utility Clearance Procedures

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted by CH2M HILL as a follow-up to the services provided by the Navy. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor (subcontracted to CH2M HILL) to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include (these are further described in Attachment C):

- **Ground Penetrating Radar (GPR),** which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF),** involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be

detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.

- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors**, are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers,** are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

The following procedures shall be used to identify and mark underground utilities during subsurface construction activities on the project:

- Contact utility companies or the state/regional utility protection service (such as Miss Utility) at least two (2) working days prior to intrusive activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation: this is a law. These services will only mark the location of public-utility-owned lines and not Navy-owned utilities. In many cases there will not be any public-utility-owned lines on the Activity. There may also be Base-access issues to overcome.
- Procure and schedule the independent survey.
- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project site, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions. ***The types of utilities must be provided to the bidding subcontractors in the SOW and procedures to be used must be specified by the bidder in their bid. It is extremely helpful to provide the sub with utility maps, with the caveat that all utilities are not necessarily depicted.***
- The survey subcontractor shall employ the same geophysical techniques used to identify the buried utilities, to survey the proposed path of subsurface investigation/construction work to confirm no buried utilities are present.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances provided by both the "Miss Utility" service and the CH2M HILL-subcontracted service are to be in writing, signed by the party conducting the clearance. The Miss Utility service will have standard notification forms/letters which typically simply state that they have been to the site and have done their work. The CH2M HILL subcontractor shall be required to fill out the form provided in Attachment D (this can be modified for a particular project) indicating that each dig/drill location has been addressed. ***This documentation requirement (with a copy of the form) needs to be provided in the subcontractor SOW.***

- Marking shall be done using the color coding presented in Attachment E. The type of material used for marking must be approved by the Activity prior to marking. Some base commanders have particular issues with persistent spray paint on their sidewalks and streets. ***Any particular marking requirements need to be provided in the subcontractor SOW.***
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Perform a field check prior to drilling/digging (preferably while the utility location sub is still at the site) to see if field utility markings coincide with locations on utility maps. Look for fire hydrants, valves, manholes, light poles, lighted signs, etc to see if they coincide with utilities identified by the subcontractor.
- Underground utility locations must be physically verified (or dig locations must be physically cleared) by hand digging using wood or fiberglass-handled tools, air knifing, or by some other acceptable means approved by CH2M HILL, when the dig location (e.g. mechanical drilling, excavating) is expected to be within 5 feet of a marked underground system. Hand clearance shall be done to a depth of four feet unless a utility cross-section is available that indicates the utility is at a greater depth. In that event, the hand clearance shall proceed until the documented depth of the utility is reached.
- Conduct a site briefing for employees at the start of the intrusive work regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

IV. Attachments

A- Example SOW for Utility Location Subcontractor Procurement
B - Services Available for Identifying and Marking Underground Utilities
C – Equipment Used for Identifying Underground Utilities
D – Utility Clearance Documentation Form
E – Utility Marking Color Codes

Attachment A – Example SOW for Subcontracting Underground Utilities Locating Services

CTO-XXX

Scope of Work

Subsurface Utility Locating

Site XX

Navy Activity

City, State

A licensed and insured utility locator will be subcontracted to identify and mark out subsurface utilities for an environmental investigation/remediation project at Site XX of <<insert name of base, city, and state>>. The subcontractor will need to be available beginning at <<insert time>> on <<insert date>>. It is estimated that the work can be completed within XX days.

Proposed Scope of Work

The subcontractor will identify and mark all subsurface utilities (CHOOSE 1) that lie within a radius of 20 feet of each of XX sampling locations at Site XX shown on the attached Figure 1; (OR) that lie within the bounds of Site XX as delineated on the attached Figure 1. (If multiple sites are to be cleared, provide maps of each site with sample locations or clearance boundaries clearly delineated and a scale provided.)

Utilities will be identified using all reasonably available as-built drawings, electronic locating devices, and any other means necessary to maintain the safety of drilling and sampling personnel and the protection of the base infrastructure. The location of utilities identified from as-built drawings or other maps must be verified in the field prior to marking.

Base utility drawings for the Site(s) (CHOOSE 1) can be found at <<insert specific department and address or phone number on the base>> and should be reviewed by the subcontractor and referenced as part of the utility locating. (OR), will be provided to the subcontractor by CH2M HILL upon the award of the subcontract. (OR), are not available. Utility drawings shall not be considered definitive and must be field verified.

Field verification will include detection using nonintrusive subsurface detection equipment (magnetometers, GPR, etc) as well as opening manhole covers to verify pipe directions. As part of the bid, the Subcontractor shall provide a list of the various subsurface investigation tools they propose to have available and use at the site and what the limitations are of each tool.

A CH2M HILL representative shall be present to coordinate utility clearance activities and identify points and features to be cleared.

Field Marking and Documentation

All utilities located within **(CHOOSE 1)** ***a 20-ft radius of the XX proposed soil boring locations*** **(OR)** ***within the boundary of the site(s)*** as identified on the attached figure(s) will be marked using **paint** ***(some Bases such as the WNY may have restrictions on the use of permanent paint)*** and/or pin flags color coded to indicate electricity, gas, water, steam, telephone, TV cable, fiber optic, sewer, etc. The color coding shall match the industry standard as described on the attached form. In addition, the ***Buried Utility Location Tracking Form*** (attached) will be completed by the Subcontractor based upon what is identified in the field during the utility locating and submitted back to CH2M HILL (field staff or project manager) within 24 hours of completing the utility locating activities.

(OPTIONAL) ***The subcontractor shall also provide a map (or hand sketch) of the identified utilities to the Engineer within XX days of field demobilization. The map shall include coordinates or ties from fixed surface features to each identified subsurface utility.***

Bid Sheet/Payment Units

The subcontractor will bid on a time and materials basis for time spent on site and researching utility maps. Mobilization (including daily travel to the site) should be bid as a lump sum, as well as the preparation of the AHA and any required mapping. The per diem line item should be used if the field crew will require overnight accommodations at the project site.

Health and Safety Requirements

The utility locating subcontractor is to provide and assume responsibility for an adequate corporate Health and Safety Plan for onsite personnel. Standard personal safety equipment including: hard hat, safety glasses, steel-toed boots, gloves are recommended for all project activities. Specific health and safety requirements will be established by the Subcontractor for each project. The health and safety requirements will be subject to the review of CH2M HILL.

The subcontractor shall also prepare and provide to the Engineer, at least 48 hours prior to mobilization, an acceptable Activity Hazard Analysis (AHA) using the attached AHA form or similar.

It is also required that all subcontractor personnel who will be on site attend the daily 15-minute health and safety tailgate meeting at the start of each day in the field.

Subcontractor personnel showing indications of being under the influence of alcohol or illegal drugs will be sent off the job site and their employers will be notified. Subcontractor personnel under the influence of prescription or over-the-counter medication that may impair their ability to operate equipment will not be permitted to do so. It is expected that the subcontractor will assign them other work and provide a capable replacement (if necessary) to operate the equipment to continue work.

Security

The work will be performed on US Navy property. CH2M HILL will identify the Subcontractor personnel who will perform the work to the appropriate Navy facility point-of-contact, and will identify the Navy point-of-contact to the Subcontractor crew. The Subcontractor bears final responsibility for coordinating access of his personnel onto Navy property to perform required work. This responsibility includes arranging logistics and providing to CH2M HILL, in advance or at time of entry as specified, any required identification information for the Subcontractor personnel. Specifically, the following information should be submitted with the bid package for all personnel that will perform the work in question (this information is required to obtain a base pass):

- Name
- Birth Place
- Birth Date
- Social Security Number
- Drivers License State and Number
- Citizenship

Please be advised that no weapons, alcohol, or drugs will be permitted on the Navy facility at any time. If any such items are found, they will be confiscated, and the Subcontractor will be dismissed.

Quality Assurance

The Subcontractor will be licensed and insured to operate in the State of <<state>> and will comply with all applicable federal, state, county and local laws and regulations. The subcontractor will maintain, calibrate, and operate all electronic locating instruments in accordance with the manufacturer's recommendations. Additionally, the Subcontractor shall make all reasonable efforts to review as-built engineering drawings maintained by Base personnel, and shall notify the CH2M HILL Project Manager in writing (email is acceptable) whenever such documentation was not available or could not be reviewed.

Subcontractor Standby Time

At certain periods during the utility locating activities, the Subcontractor's personnel may be asked to stop work and standby when work may normally occur. During such times, the Subcontractor will cease activities until directed by the CH2M HILL representative to resume operations. Subcontractor standby time also will include potential delays caused by the CH2M HILL representative not arriving at the site by the agreed-upon meeting time for start of the work day. Standby will be paid to the

Subcontractor at the hourly rate specified in the Subcontractor's Bid Form attached to these specifications.

Cumulative Subcontractor standby will be accrued in increments no shorter than 15 minutes (i.e., an individual standby episode of less than 15 minutes is not chargeable).

During periods for which standby time is paid, the surveying equipment will not be demobilized and the team will remain at the site. At the conclusion of each day, the daily logs for the Subcontractor and CH2M HILL representative will indicate the amount of standby time incurred by the Subcontractor, if any. Payment will be made only for standby time recorded on CH2M HILL's daily logs.

Down Time

Should equipment furnished by the Subcontractor malfunction, preventing the effective and efficient prosecution of the work, or inclement weather conditions prevent safe and effective work from occurring, down time will be indicated in the Subcontractor's and CH2M Hill representative's daily logs. No payment will be made for down time.

Schedule

It is anticipated that the subsurface utility locating activities will occur on <<insert date>>. It is estimated that the above scope will be completed within XXX days.

Attachment B - Services Available for Identifying and Marking Underground Utilities

The services that are available to us for identifying and marking underground utilities are:

- The Activity's PWC (or similar organization)
- The local public/private utility -run service such as Miss Utility
- Utility location subcontractors (hired by CH2M HILL)

Each are discussed below.

Navy Public Works Department

A Public Works Department (PWD) is usually present at each Activity. The PWD is responsible for maintaining the public works at the base including management of utilities. In many cases, the PWD has a written permit process in place to identify and mark-out the locations of Navy-owned utilities [Note: The PWD is usually NOT responsible for the locations/mark-outs of non-Navy owned, public utilities (e.g., Washington Gas, Virginia Power, municipal water and sewer, etc.). Therefore, it is likely that we will have to contact other organizations besides the PWD in order to identify non-Navy owned, public utilities].

At some Activities, there may not be a PWD, the PWD may not have a written permit process in place, or the PWD may not take responsibility for utility locating and mark-outs. In these cases, the PWD should still be contacted since it is likely that they will have the best understanding of the utility locations at the Activity (i.e., engineering drawings, institutional knowledge, etc.). Subsequently, the PWD should be brought into a cooperative arrangement (if possible) with the other services employed in utility locating and mark-out in order to have the most comprehensive assessment performed.

At all Activities we should have a contact (name and phone number), and preferably an established relationship, with PWD, either directly or through the NAVFAC Atlantic, Midlant, or Washington NTR or Activity Environmental Office that we can work with and contact in the event of problems.

Miss Utility or "One Call" Services for Public Utility Mark-outs

Miss Utility or "One Call" service centers are information exchange centers for excavators, contractors and property owners planning any kind of excavation or digging. The "One Call" center notifies participating public utilities of the upcoming excavation work so they can locate and mark their underground utilities in advance to prevent possible damage to underground utility lines, injury, property damage and service outages. In some instances, such with southeastern Virginia bases, the Navy has entered into agreement with Ms. Utilities and is part of the response process for Miss

Utilities. Generally, a minimum of 48 hours is required for the public utility mark-outs to be performed. The "One Call" services are free to the public. Note that the "One Call" centers only coordinate with participating public utilities. There may be some public utilities that do NOT participate in the "One Call" center which may need to be contacted separately. For example, in Washington, DC, the Miss Utility "One Call" center does not locate and mark public sewer and water lines. Therefore, the municipal water and sewer authority must be contacted separately to have the sewer and water lines marked out. The AM should contact the appropriate one-call center to determine their scope of services.

A national listing of the "One Call" service centers for each state is presented on the web at http://www.underspace.com/refs/ocdir.htm. For the Mid-Atlantic region, the following "One Call" service centers are available.

Name	**Phone**	**Website**	**Comments**
Miss Utility of DELMARVA	800-257-7777	www.missutility.net	Public utility mark-outs in Delaware, Maryland, Washington, DC, and Northern Virginia
Miss Utility of Southern Virginia (One Call)	800-552-7001	not available	Public utility mark-outs in Southern Virginia
Miss Utility of Virginia	800-257-7777 800-552-7007	www.missutilityofvirginia.com	General information on public utility mark-outs in Virginia, with links to Miss Utility of DELMARVA and Miss Utility of Southern Virginia (One Call)
Miss Utility of West Virginia, Inc	800-245-4848	none	Call to determine what utilities they work with in West Virginia
North Carolina One Call Center	800-632-4949	www.ncocc.org/ncocc/default.htm	Public Utility Markouts in North Carolina

Private Subcontractors

1. Utility-locating support is required at some level for most all CH2M HILL field projects in "clearing" proposed subsurface boring locations on the project site. Utility location and sample clearance can include a comprehensive effort of GIS map interpretation, professional land surveying, field locating, and geophysical surveying. Since we can usually provide our own GIS-related services for projects and our professional land surveying services are normally procured separately, utility-locating subcontractors will normally only be required for some level of geophysical surveying support in the field. This level of geophysical surveying support can range widely from a simple electromagnetic (EM) survey over a known utility line, to a blind geophysical effort, including a ground-penetrating radar (GPR) survey and/or a comprehensive EM survey to delineate and characterize all unknown subsurface anomalies.

   The level of service required from the subcontractor will vary depending on the nature of the site. At sites where utility locations are well defined on the maps and recent construction is limited, CH2M HILL may be confident with a limited effort from a traditional utility-locating subcontractor providing a simple EM survey. At sites where utility locations are not well defined, where recent constructions may have altered utility locations, or the nature of the site makes utility location difficult, CH2M HILL will require the services of a comprehensive geophysical surveying subcontractor, with a wide range of GPR and EM services available for use on an "as-needed" basis. Typical costs for geophysical surveying subcontractors will range from approximately $200 per day for a simple EM effort (usually one crew member and one instrument) to approximately $1,500 per day for a comprehensive geophysical surveying effort (usually a two-person crew and multiple instruments). Comprehensive geophysical surveying efforts may also include field data interpretation (and subsequent report preparation) and non-destructive excavation to field-verify utility depths and locations.

The following table provides a list of recommended geophysical surveying support subcontractors that can be used for utility-locating services:

Company Name and Address	Contact Name and Phone Number	Equipment[1]					Other Services[2]		
		1	2	3	4	5	A	B	C
US Radar, Inc.* PO Box 319 Matawan, NJ 07747	Ron LaBarca 732-566-2035			4					
Utilities Search, Inc.*	Jim Davis 703-369-5758	4				4	4	4	4
So Deep, Inc.* 8397 Euclid Avenue Manassas Park, VA 20111	703-361-6005	4					4	4	4
Accurate Locating, Inc. 1327 Ashton Rd., Suite 101 Hanover, MD 21076	Ken Shipley 410-850-0280	4	4						
NAEVA Geophysics, Inc. P.O. Box 7325 Charlottesville, VA 22906	Alan Mazurowski 434-978-3187	4	4	4	4	4	4	4	4
Earth Resources Technology. Inc. 8106 Stayton Rd. Jessup, MD 20794	Peter Li 240-554-0161	4	4	4	4	4	4	4	
Geophex, Ltd 605 Mercury Street Raleigh, NC 27603	I. J. Won 919-839-8515	4	4	4	4	4	4	4	4

Notes:

*Companies denoted with an asterisk have demonstrated reluctance to assume responsibility for damage to underground utilities or an inability to accommodate the insurance requirements that CH2M HILL requests for this type of work at many Navy sites.

[1]Equipment types are:

1. Simple electromagnetic instruments, usually hand-held
2. Other, more innovative, electromagnetic instruments, including larger instruments for more area coverage
3. Ground-penetrating radar systems of all kinds
4. Audio-frequency detectors of all kinds
5. Radio-frequency detectors of all kinds

[2]Other services include:

A. Data interpretation and/or report preparation to provide a permanent record of the geophysical survey results and a professional interpretation of the findings, including expected accuracy and precision.

B. Non-destructive excavation to field-verify the depths, locations, and types of subsurface utilities.

C. Concrete/asphalt coring and pavement/surface restoration.

Attachment C – Equipment Used for Identifying Underground Utilities

This attachment provides a summary of the various types of equipment used for subsurface utility location. It describes the capabilities and limitations of each in order to help the AM and PM determine if the equipment being proposed by a subcontractor or Navy is adequate. A list of in-house experts that can be used to answer questions you may have is provided below.

CH2M HILL In-house Utility Location Experts

Tamir Klaff/WDC

Home Office Phone – 703-669-9611

Electromagnetic Induction (EMI) Methods

EMI instruments, in general, induce an electromagnetic field into the ground (the primary field) and then record the response (the secondary field), if any. Lateral changes in subsurface conductivity, such as caused by the presence of buried metal or by significant soil variations, cause changes in the secondary field recorded by the instrument and thus enable detection and mapping of the subsurface features. It should be noted that EMI only works for electrically conductive materials--plastic or PVC pipes are generally not detected with EMI. Water and gas lines are commonly plastic, although most new lines include a copper “locator” strip on the top of the PVC to allow for detection with EMI.

EMI technology encompasses a wide range of instruments, each with inherent strengths and weaknesses for particular applications. One major division of EMI is between “time-domain” and “frequency-domain” instruments that differ in the aspect of the secondary field they detect. Another difference in EMI instruments is the operating frequency they use to transmit the primary field. Audio- and radio-frequencies are often used for utility detection, although other frequencies are also used. Consideration of the type of utility expected, surface features that could interfere with detection, and the “congestion” of utilities in an area, should be made when choosing a particular EMI instrument for a particular site.

One common EMI tool used for utility location is a handheld unit that can be used to quickly scan an area for utilities and allows for marking locations in “real time”. This method is most commonly used by “dig-safe” contractors marking out known utilities prior to excavation. It should be noted that this method works best when a signal (the primary field) can be placed directly onto the line (i.e., by clamping or otherwise connecting to the end of the line visible at the surface, or for larger utilities such as sewers, by running a transmitter through the utility). These types of tools also have a limited capability to scan an area for unknown utilities. Usually this requires having enough area to separate a hand held transmitter at least a hundred feet from the receiver. Whether hunting for unknown, or confirming known, utilities, this method will only detect continuous lengths of metallic conductors.

In addition to the handheld EMI units, larger, more powerful EMI tools are available that provide more comprehensive detection and mapping of subsurface features. Generally, data with these methods are collected on a regular grid in the investigation area, and are then analyzed to locate linear anomalies that can be interpreted as utilities. These methods will usually detect *all* subsurface metal (above a minimum size), including pieces of abandoned utilities. In addition, in some situations, backfill can be detected against native soils giving information on trenching and possible utility location. Drawbacks to these methods are that the secondary signals from utilities are often swamped (i.e., undetectable) close to buildings and other cultural features, and that the subsurface at heavily built-up sites may be too complicated to confidently interpret completely.

Hand-held metal detectors (treasure-finders) are usually based on EMI technology. They can be used to locate shallow buried metal associated with utilities (e.g., junctions, manholes, metallic locators). Advantages of these tools is the ease of use and real-time marking of anomalies. Drawbacks include limited depths of investigations and no data storage capacity.

Ground Penetrating Radar (GPR)

GPR systems transmit radio and microwave frequency (e.g., 80 megaHertz to 1,000 megaHertz) waves into the ground and then record reflections of those waves coming back to the surface. Reflections of the radar waves typically occur at lithologic changes, subsurface discontinuities, and subsurface structures. Plastic and PVC pipes can sometimes be detected in GPR data, especially if they are shallow, large, and full of a contrasting material such as air in a wet soil, or water in a dry soil. GPR data are usually collected in regular patterns over an area and then analyzed for linear anomalies that can be interpreted as utilities. GPR is usually very accurate in x-y location of utilities, and can be calibrated at a site to give very accurate depth information as well. A significant drawback to GPR is that depth of investigation is highly dependant on background soil conductivity, and it will not work on all sites. It is not uncommon to get only 1-2 feet of penetration with the signal in damp, clayey environments. Another drawback to GPR is that sites containing significant fill material (e.g., concrete rubble, scrap metal, garbage) will result in complicated anomalies that are difficult or impossible to interpret.

Magnetic Field Methods

Magnetic field methods rely on detecting changes to the earth's magnetic field caused by ferrous metal objects. This method is usually more sensitive to magnetic metal (i.e., deeper detection) than EMI methods. A drawback to this method is it is more susceptible to being swamped by surface features such as fences and cars. In addition, procedures must usually be implemented that account for natural variations in the earth's background field as it changes throughout the day. One common use of the method is to measure and analyze the gradient of the magnetic field, which eliminates most of the drawbacks to the method. It should be noted this method only detects ferrous metal, primarily iron and steel for utility location applications. Some utility detector combine magnetic and EMI methods into a single hand-held unit.

Optical Methods

Down the hole cameras may be useful in visually reviewing a pipe for empty conduits and/or vaults.

Attachment D – Utility Clearance Documentation Form

Attachment E – Utility Marking Color Codes

The following is the standard color code used by industry to mark various types of utilities and other features at a construction site.

White – Proposed excavations and borings

Pink – Temporary survey markings

Red – Electrical power lines, cables, conduits and lighting cables

Yellow – Gas, oil, steam, petroleum or gaseous materials

Orange – Communication, alarm or signal lines, cables, or conduits

Blue – Potable water

Purple – Reclaimed water, irrigation and slurry lines

Green – Sewer and storm drain lines

PMS 219

PMS 1795*

[illegible]

PMS 144*

13.5 parts process
2.5 parts reflex

PMS 253

PMS 3415

APWA UNIFORM COLOR CODE

WHITE - Proposed Excavation

PINK - Temporary Survey Markings

RED - Electric Power Lines, Cables, Conduit and Lighting Cables

YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials

ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit

BLUE - Potable Water

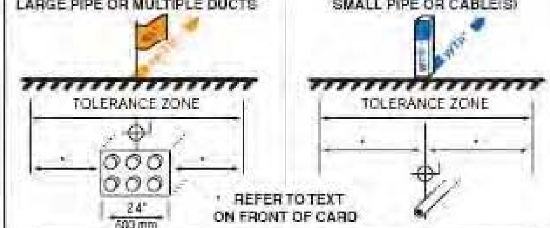
PURPLE - Reclaimed Water, Irrigation and Slurry Lines

GREEN - Sewers and Drain Lines

TYPICAL MARKING

LARGE PIPE OR MULTIPLE DUCTS

SMALL PIPE OR CABLE(S)



Customize with your center's phone and address information

GUIDELINES FOR UNIFORM TEMPORARY MARKING OF UNDERGROUND FACILITIES

This marking guide provides for universal use and understanding of the temporary marking of subsurface facilities to prevent accidents and damage or service interruption by contractors, excavators, utility companies, municipalities or any others working on or near underground facilities.

ONE-CALL SYSTEMS
The One-Call damage prevention system shall be contacted prior to excavation.

PROPOSED EXCAVATION
Use white marks to show the location, route or boundary of proposed excavation. Surface marks on roadways do not exceed 1.5" by 18" (40 mm by 450 mm). The facility color and facility owner identity may be added to white flags or stakes.

USE OF TEMPORARY MARKING
Use color-coded surface marks (i.e., paint or chalk) to indicate the location or route of active and out-of-service buried lines. To increase visibility, color coded vertical markers (i.e., stakes or flags) should supplement surface marks. Marks and markers indicate the name, initials or logo of the company that owns or operates the line, and width of the facility if it is greater than 2" (50 mm). Marks placed by other than line owner/operator or its agent indicate the identity of the designating firm. Multiple lines in joint trench are marked in tandem. If the surface over the buried line is to be removed, supplementary offset markings are used. Offset markings are on a uniform alignment and clearly indicate the actual facility is a specific distance away.

TOLERANCE ZONE
Any excavation within the tolerance zone is performed with non-powered hand tools or non-invasive method until the marked facility is exposed. The width of the tolerance zone may be specified in law or code. If not, a tolerance zone including the width of the facility plus 18" (450 mm) measured horizontally from each side of the facility is recommended.

ADOPT UNIFORM COLOR CODE
The American Public Works Association encourages public agencies, utilities, contractors, other associations, manufacturers and all others involved in excavation to adopt the APWA Uniform Color Code, using ANSI standard Z535.1 Safety Colors for temporary marking and facility identification.

Rev. 4/99

Buried Utility Location Tracking Form

(Submit to CH2M HILL PM within 24 hrs of location activities)

Project Location:
CH2M HILL Project No.:
CH2M HILL Project Manager: Name/Phone:
Fax:
Email:
CH2M HILL Field Team Leader: Name/Phone:

CH2M HILL Purchase Order:

Utility Location Subcontractor:
Subcontractor POC:

Dates of location activities:

	Check each box using an "X" if a buried utility is present within 5 feet of a marked Station ID. If color of the flag or paint differs from listed color, note change in color on the form.																
Station ID	**Gas (Yellow)**	**Electric (Red)**	**Fiber optic (Orange)**	**Cable (Orange)**	**Water (Blue)**	**San. Sewer (Green)**	**Storm Sewer (Green)**	**Steam (Yellow)**	**Petroleum (Yellow)**	**Compressed air (Yellow)**	**Other ____**	**Other ____**	**Other ____**	**Other ____**	**Date completed**	**Technician initials**	Notes (methods/tools used)

The findings of the buried utility location activities summarized herein were conducted in strict accordance with the CH2M HILL scope of work.

______________________ ____________
Subcontractor's Signature Date

Installation of Monitoring Wells by Sonic Drilling

I. Purpose and Scope

The purpose of this guideline is to describe methods for drilling and installation of groundwater monitoring wells and piezometers in unconsolidated or poorly consolidated materials using sonic drilling techniques. Sonic drilling technology eliminates telescoping monitoring wells, allowing the installation of aquifer penetrating, single-cased wells.

II. Equipment and Materials

Drilling

- Sonic drilling rig
- Temporary outer steel casing
- Drill rods and core barrel

Well Riser/Screen

- Polyvinyl chloride (PVC), Schedule 40, minimum 2-inch ID, flush-threaded riser; alternatively, stainless steel riser
- PVC, Schedule 40, minimum 2-inch ID, flush-threaded, factory slotted screen; alternatively, stainless steel screen.

Bottom Cap

- PVC, threaded to match the well screen; alternatively, stainless steel
- Centering guides (if used)

Well Cap

- Above-grade well completion: PVC, threaded or push-on type, vented
- Flush-mount well completion: PVC, locking, leak-proof seal
- Stainless steel to be used as appropriate

Sand

- Clean silica sand, provided in factory-sealed bags, well-rounded, containing no organic material, anhydrite, gypsum, mica, or calcareous material; primary (coarse – e.g., Morie #1) filter pack, and secondary (fine sand seal) filter pack. Grain size determined based on sediments observed during drilling.

Bentonite

- Pure, additive-free bentonite pellets
- Pure, additive-free powdered bentonite
- Coated bentonite pellets; coating must biodegrade within 7 days
- Cement-Bentonite Grout: proportion of 6 to 8 gallons of water per 94-pound bag of Portland cement; 3 to 6 pounds of bentonite added per bag of cement to reduce shrinkage

Protective Casing

- Above-grade well completion: 6-inch minimum ID black iron steel pipe with locking cover, diameter at least 2 inches greater than the well casing, painted with epoxy paint for rust protection; heavy duty lock; protective posts if appropriate
- Flush-mount well completion: Morrison 9-inch or 12-inch 519 manhole cover, or equivalent; rubber seal to prevent leakage; locking cover inside of road box

Well Development

- Surge block
- Well-development pump and associated equipment
- Calibrated meters to measure pH, temperature, specific conductance, ORP, and dissolved oxygen of development water
- Containers (e.g., 55 gallon drums) for water produced from well.

III. Procedures and Guidelines

A. Drilling Method

Drill rods and core barrel with a minimum 8-inch inside diameter (ID) will be used to drill monitoring well boreholes. Continuous core soil samples (6-inches outside diameter) will be collected for lithologic classification and intervals may be selected for chemical analysis. Soil sampling procedures are detailed in SOP *Shallow Soil Sampling.*

The use of water and drilling fluid to assist in sonic drilling for monitoring well installation will be minimized, unless required for such conditions as running sands or drilling bedrock formations.

Temporary outer casing, drill rods, core barrels, and other downhole drilling tools will be properly decontaminated prior to the initiation of drilling activities and between each borehole location. Core barrels and other downhole soil sampling equipment will also be properly decontaminated before and after each use. SOP *Decontamination of Drilling Rigs and Equipment* details proper decontamination procedures.

Drill cuttings and decontamination fluids generated during well drilling activities will be contained according to the procedures detailed in the Field Sampling Plan.

B. Monitoring Well Installation

Sonic drilling technology eliminates the necessity to install double or triple cased wells since the borehole will be fully cased during drilling activities. Monitoring wells will be constructed inside the temporary outer casing, once the borehole has been advanced to the desired depth. Following setting the well screen, riser, filter pack, and bentonite seal, the well will be grouted as the temporary casing is withdrawn, preventing cross contamination. If the borehole has been drilled to a depth greater than that at which the well is to be set, the borehole will be backfilled with bentonite pellets or a bentonite-cement slurry to a depth approximately 1 foot below the intended well depth. Approximately 1 foot of clean sand will be placed on top of the bentonite to return the borehole to the proper depth for well installation.

The appropriate lengths of well screen, nominally 10 feet (with bottom cap), and casing will be joined watertight and lowered inside the temporary casing to the bottom of the borehole. Centering guides, if used, will be placed at the bottom of the screen and above the interval in which the bentonite seal is placed.

Selection of the filter pack and well screen intervals for the shallow monitoring wells shall be made in the field.

A primary sand pack consisting of clean Morie No. 00 (or DSI No.1) silica sand for 10-slot screen and Morie No. 01 (or DSI No.2) for 20-slot screen silica sand will be placed around the well screen. The sand will be placed into the borehole at a uniform rate, in a manner that will allow even placement of the sand pack. The temporary casing will be raised gradually during sand pack installation to avoid caving of the borehole wall; at no time will the temporary casing be raised higher than the top of the sand pack during installation. During placement of the sand, the position of the top of the sand will be continuously sounded. The primary sand pack will be extended from the bottom of the borehole to a minimum height of 2 feet above the top of the well screen. A secondary, finer-grained sand pack may be installed for a minimum of 1 foot above the coarse sand pack. Heights of the coarse and fine sand packs and bentonite seal may be modified in the field to account for the shallow water table and small saturated thickness of the surficial aquifer.

A bentonite seal at least 2 feet thick will be placed above the sand pack. The seal will be placed into the borehole in a manner that will prevent bridging. The position of the top of the bentonite seal will be verified using a weighted tape measure. If all or a portion of the bentonite seal is above the water table, clean water will be added to hydrate the bentonite. A hydration period of at least 30 minutes will be required following installation of the bentonite seal.

Above the bentonite seal, an annular seal of cement-bentonite grout will be placed. The cement-bentonite grout will be installed continuously in one operation from the bottom of the space to be grouted to the ground surface through a tremie pipe. The tremie pipe must be plugged at the bottom and have small openings along the sides of the bottom 1-foot length of pipe. This will allow the grout to diffuse laterally into the borehole and not disturb the bentonite pellet seal.

C. Well Completion

For monitoring wells that will be completed above-grade, a locking steel protective casing set in a concrete pad will be installed. The steel protective casing will extend at least 3 feet into the ground and 2 feet above ground but should not penetrate the bentonite seal. The concrete pad will be square, approximately 2 feet per side (unless otherwise specified in the project plans), and poured into wooden forms. The concrete will be sloped away from the protective casing.

Guard posts may be installed in high-traffic areas for additional protection. Four steel guard posts will be installed around the protective casing, within the edges of the concrete pad. Guard posts will be concrete-filled, at least 2 inches in diameter, and will extend at least 2 feet into the ground and 3 feet above the ground. The protective casing and guard posts will be painted with an epoxy paint to prevent rust.

For monitoring wells with flush-mount completions, Morrison 9-inch or 12-inch 519 manhole cover or equivalent, with a rubber-sealed cover and drain will be installed. The top of the manhole cover will be positioned approximately 1 inch above grade. A square concrete pad, approximately 2 feet per side (unless otherwise specified in the project plans), will be installed as a concrete collar surrounding the road box cover, and will slope uniformly downward to the adjacent grade. The road box and installation thereof will be of sufficient strength to withstand normal vehicular traffic.

Concrete pads installed at all wells will be a minimum of 6 inches below grade. The concrete pad will be 12-inches thick at the center and taper to 6-inch thick at the edge. The surface of the pad should slope away from the protective casing to prevent water from pooling around the casing. Protective casing, guard posts, and flush mounts will be installed into this concrete.

Each well will be properly labeled on the exterior of the locking cap or protective casing with a metal stamp indicating the permanent well number.

C. Well Development

Well development will be accomplished using a combination of surging throughout the well screen and pumping, until the physical and chemical parameters of the discharge water that are measured in the field have stabilized and the turbidity of the discharge water is substantially reduced.

Fine-grained materials in the surficial aquifer at the site may not allow low turbidity results to be achieved.

The surging apparatus will include a surge block. Well development will begin by surging the well screen, starting at the bottom of the screen and proceeding upwards, throughout the screened zone. Following surging, the well will be pumped to remove the fine materials that have been drawn into the well. During pumping, measurements of pH, temperature, and specific conductance will be recorded.

Development will continue by alternately surging and pumping until the discharge water is free from sand and silt, the turbidity is substantially reduced, and the pH, temperature, and specific conductance have stabilized at regional background levels, based on historical data. Development will continue for a minimum of 30 minutes and until the water removed from the well is as clear of turbidity as practicable.

Well development equipment will be decontaminated prior to initial use and after the development of each well. Decontamination procedures are detailed in SOP *Decontamination of Personnel and Equipment*. Water generated during well development will be contained and managed as detailed in the SOP *Disposal of Waste Fluids and Solids* and the Investigation Derived Waste Management Plan.

IV. Attachments

Schematic diagram of shallow monitoring well construction (MWSingleDiag.xls)

PROJECT NUMBER	WELL NUMBER SHEET 1 OF 1

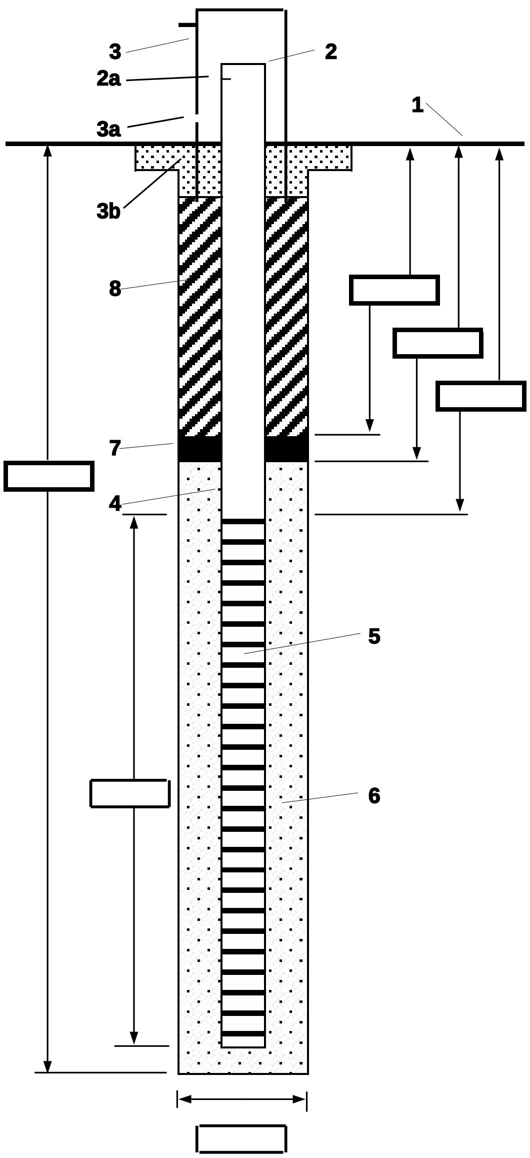
WELL COMPLETION DIAGRAM

PROJECT : LOCATION :

DRILLING CONTRACTOR :

DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS : START : END : LOGGER :



1- Ground elevation at well ____________

2- Top of casing elevation ____________
a) vent hole? ____________

3- Wellhead protection cover type ____________
a) weep hole? ____________
b) concrete pad dimensions ____________

4- Dia./type of well casing ____________

5- Type/slot size of screen ____________

6- Type screen filter ____________
a) Quantity used ____________

7- Type of seal ____________
a) Quantity used ____________

8- Grout
a) Grout mix used ____________
b) Method of placement ____________
c) Vol. of well casing grout ____________

Development method ____________

Development time ____________

Estimated purge volume ____________

Comments ____________

STANDARD OPERATING PROCEDURE - 004

Low-Flow Groundwater Sampling from Monitoring Wells

I. Purpose and Scope

This SOP presents general guidelines for the collection of groundwater samples from monitoring wells using low-flow purging and sampling procedures. Operations manuals should be consulted for specific calibration and operating procedures.

II. Equipment and Materials

- Adjustable-rate positive-displacement pump, submersible pump, or peristaltic pump
- Horiba® U-22 or equivalent water quality meters to monitor pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature
- Flow-through cell with inlet/outlet ports for purged groundwater and watertight ports for each probe
- Generator or alternate power source depending on pump type
- Water-level indicator
- Disposable polyethylene tubing
- Plastic sheeting
- Well-construction information
- Calibrated container and stopwatch to determine flow rate
- Sample containers
- In-line disposable 0.45µm filters (QED® FF8100 or equivalent)
- Shipping supplies (labels, coolers, and ice)
- Field book

III. Procedures and Guidelines

A. Setup and Purging

1. Obtain information on well location, diameter(s), depth, and screen interval(s), and the method for disposal of purged water.

2. Calibrate instruments according to manufacturer's instructions.

3. The well number, site, date, and condition are recorded in the field logbook.

4. Plastic sheeting is placed on the ground, and the well is unlocked and opened. All decontaminated equipment to be used in sampling will be placed only on the plastic sheeting until after the sampling has been completed. To avoid cross-contamination, do not let any downhole equipment touch the ground.

5. All sampling equipment and any other equipment to be placed in the well is cleaned and decontaminated before sampling in accordance with SOP *Decontamination of Personnel and Equipment*.

6. Water level measurements are collected in accordance with the *Water Level Measurements* SOP. **Do not measure the depth to the bottom of the well at this time**; this reduces the possibility that any accumulated sediment in the well will be disturbed. Obtain depth to bottom information from well construction log.

7. Attach and secure the polyethylene tubing to the low-flow pump. Lower the pump slowly into the well and set it at approximately the middle of the screen. Place the pump intake at least two feet above the bottom of the well to avoid mobilization of any sediment present in the bottom. Preferably, the pump should be in the middle of the screen.

8. Insert the measurement probes into the flow-through cell. The purged groundwater is directed through the cell, allowing measurements to be collected before the water contacts the atmosphere.

9. Start purging the well at 0.2 to 0.5 liters per minute. Avoid surging. Purging rates for more transmissive formations could be started at 0.5-liter to 1 liter per minute. The initial field parameters of pH, specific conductance, dissolved oxygen, ORP, turbidity, and temperature of water are measured and recorded in the field logbook.

10. The water level should be monitored during purging, and, ideally, the purge rate should equal the well recharge rate so that there is little or no drawdown in the well (i.e., less than 0.5-foot). The water level should stabilize for the specific purge rate. There should be at least 1 foot of water over the pump intake so there is no risk of the pump suction being broken, or entrainment of air in the sample. Record adjustments in the purge rate and changes in depth to water in the logbook. Purge rates should, if needed, be decreased to the minimum capabilities of the pump (0.1- to 0.2-liter per minute) to avoid affecting well drawdown.

11. During purging, the field parameters are measured frequently (every 3 to 5 minutes) until the parameters have stabilized. Field parameters are considered stable when measurements meet the following criteria:

- pH: within 0.1 pH units
- Specific conductance: within 3 percent
- Dissolved oxygen: within 10 percent
- Turbidity: within 10 percent or as low as practicable given sampling conditions
- ORP: within 10 mV

B. Sample Collection

Once purging is complete the well is ready to sample. The elapsed time between completion of purging and collection of the groundwater sample should be minimized. Typically, the sample is collected immediately after the well has been purged, but this is also dependent on well recovery.

Samples will be placed in sample containers that have been cleaned to laboratory standards and are preserved in accordance with the analytical method. The containers are typically pre-preserved, if required.

The steps to be followed for sample collection are as follows:

1. The cap is removed from the sample bottle, and the bottle is tilted slightly.
2. The sample is slowly poured from the bailer or discharged from the pump so that it runs down the inside of the sample bottle with a minimum of splashing. The pumping rate should be reduced to approximately 100 ml per minute when sampling VOCs.
3. Inorganics, including metals, may be collected and preserved in the filtered form as well as the unfiltered form. Disposable in-line filters (0.45 micron filter), connected to the end of the sample tubing,, are typically used for field filtration. Samples are field filtered as the water is being placed into the sample container. If a bailer is used, filtration may be driven by a peristaltic pump.
4. Adequate space is left in the bottle to allow for expansion, except for VOC vials, which are filled to the top with a positive meniscus.
5. The bottle is capped and clearly labeled.
6. Samples are placed in appropriate containers and, if necessary, packed with ice in coolers as soon as practical.
7. Nondedicated equipment is cleaned and decontaminated in accordance with the *Decontamination of Personnel and Equipment* SOP.

The following information, at a minimum, will be recorded in the log book:

1. Sample identification (site name, location, and project number; sample name/number and location; sample type and matrix; time and date; sampler's identity)
2. Sample source and source description
3. Field observations and measurements (appearance, volatile screening, field chemistry, sampling method), volume of water purged prior to sampling, number of well volumes purged, and field parameter measurements
4. Sample disposition (preservative; laboratory name, date and time sent; laboratory sample number, chain-of-custody number, sample bottle lot number)
5. Additional remarks

C. Additional remarks

1. If the well goes dry during purging, wait until it recovers sufficiently to remove the required volumes to sample all parameters. It may be necessary to return periodically to the well but a particular sample (e.g., large amber bottles for semivolatile analysis) should be filled at one time rather than over the course of two or more visits to the well.

2. There may be circumstances where a positive-displacement or submersible pump cannot be used. An example is at isolated, hard-to-reach locations where the required power supply cannot be brought. In this case, a peristaltic pump may be used. Samples can be collected by the procedures described above for all but those for VOC analysis. The water to be placed in the vials for VOC analysis should not be run through the peristaltic pump but instead should be collected by the following:

   - Stop the pump when it is time to collect the VOC sample.
   - Disconnect the tubing upstream from the pump (a connector must be installed in the line to do this).
   - Pinching the tubing to keep the water in the tubing, remove the tubing from the well. Be sure that the tubing does not contact other than clean surfaces.
   - Place the end of the tubing that was in the well into each VOC vial and fill the vial by removing the finger from the other end of the tube.
   - Once the vials are filled, return the tubing to the well and collect any other samples required.

4. Disposable polyethylene tubing is disposed of with PPE and other site trash.

IV. Attachments

White paper on reasons and rationale for low-flow sampling.

V. Key Checks and Preventative Maintenance

- The drawdown in the well should be minimized as much as possible (preferably no more than 0.5-foot to 1 foot) so that natural groundwater-flow conditions are maintained as closely as possible.
- The highest purging rate should not exceed 1 liter per minute. This is to keep the drawdown minimized.
- Stirring up of sediment in the well should be avoided so that turbidity containing adsorbed chemicals is not suspended in the well and taken in by the pump.
- Overheating of the pump should be avoided to minimize the potential for losing VOCs through volatilization.
- Keep the working space clean with plastic sheeting and good housekeeping.
- Maintain field equipment in accordance with the manufacturer's recommendations. This will include, but is not limited to:
    - Inspect sampling pump regularly and replace as warranted
    - Inspect quick-connects regularly and replace as warranted
    - Verify battery charge, calibration, and proper working order of field measurement equipment prior to initial mobilization and daily during field efforts

Attachment to the SOP on Low-Flow Sampling Groundwater Sampling from Monitoring Wells

White Paper on Low-Flow Sampling

EPA recommends low-flow sampling as a means of collecting groundwater samples in a way that minimizes the disturbance to the natural groundwater flow system and minimizes the introduction of contamination into the samples from extraneous sources. The following are details about these issues.

When a pump removes groundwater from the well at the same rate that groundwater enters the well through the screen, the natural groundwater-flow system around the well experiences a minimum of disturbance. Some disturbance is bound to occur because you are causing groundwater to flow to the well in a radial fashion that otherwise would have flowed past it. However, the resulting low-flow sample provides the most-representative indication we can get of groundwater quality in the immediate vicinity of the well.

Normally, when a well is pumped at an excessive rate that drops the water level in the well below the water level in the aquifer, the water cascades down the inside of the well screen when it enters the well. The turbulence from this cascading causes gases such as oxygen and carbon dioxide to mix with the water in concentrations that are not representative of the native groundwater and are higher than expected. This causes geochemical changes in the nature of the water that can change the concentrations of some analytes, particularly metals, in the groundwater sample, not mention it’s effect on the dissolved oxygen levels that then will be measured in the flow-through cell. Such turbulence also may cause lower-than-expected concentrations of volatile organic compounds due to volatilization.

For wells in which the water level is above the top of the screen, the water up in the riser is out of the natural circulation of the groundwater and, therefore, can become stagnant. This stagnant water is no longer representative of natural groundwater quality because its pH, dissolved-oxygen content, and other geochemical characteristics change as it contacts the air in the riser. If we minimize the drawdown in the well when we pump, then we minimize the amount of this stagnant water that is brought down into the well screen and potentially into the pump. As a result, a more-representative sample is obtained.

Typically, wells contain some sediment in the bottom of the well, either as a residue from development that has settled out of the water column or that has sifted through the sand pack and screen since the well was installed. This sediment commonly has adsorbed on it such analytes as metals, SVOCs, and dioxins that normally would not be dissolved in the groundwater. If these sediments are picked up in the groundwater when the well is disturbed by excessive pumping, they can:

- Make filtering the samples for metals analysis more difficult
- Add unreasonably to the measured concentration of SVOCs and other organic compounds

The SOP for low-flow sampling has been modified recently and should be consulted for additional information about low-flow sampling and ways of dealing with wells in which the water level cannot be maintained at a constant level.

STANDARD OPERATING PROCEDURE - 005

VOC Sampling--Water

I. Purpose

To provide general guidelines for sampling aqueous volatile organic compounds.

II. Scope

Standard techniques for collecting representative samples are summarized. Site-specific details are discussed in the Field Sampling Plan.

III. Equipment and Materials

- Sample vials pre-preserved at laboratory with Hydrochloric acid (HCl)
- Surgical or latex gloves

IV. Procedures and Guidelines

1. Sample VOCs before sampling other analyte groups.

2. When sampling for VOCs, especially residential wells, evaluate the area around the sampling point for possible sources of air contamination by VOCs. Products that may give off VOCs and possibly contaminate a sample include perfumes and cosmetics, skin applied pharmaceuticals, automotive products (gasoline, starting fluid, windshield deicers, carburetor cleaners, etc.) and household paint products (paint strippers, thinners, turpentine, etc.).

3. Keep the caps off the sample vials for as short a time as possible.

4. Wear clean latex or surgical gloves.

5. Fill the sample vial immediately, allowing the water stream to strike the inner wall of the vial to minimize formation of air bubbles. DO NOT RINSE THE SAMPLE VIALS BEFORE FILLING.

6. Fill the sample vial with a minimum of turbulence, until the water forms a positive meniscus at the brim.

7. Replace the cap by gently setting it on the water meniscus. Tighten firmly, but DO NOT OVERTIGHTEN.

8. Invert the vial and tap it lightly. If you see air bubbles in the sample, do not add more sample. Use another vial to collect another sample. Repeat if necessary until you obtain a proper sample.

V. Attachments

None.

VI. Key Checks and Items

- Check for possible sources of contamination.
- Fill slowly, with as little turbulence as possible.
- Check for air bubbles.

STANDARD OPERATING PROCEDURE - 006

Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, ORP, and Temperature Using a Water Quality Parameter Meter with Flow-through Cell

I. Purpose and Scope

The purpose of this procedure is to provide a general guideline for using a water quality parameter meter (e.g., Horiba® U-22, YSI, or similar) for field measurements of pH, specific conductance, turbidity, dissolved oxygen, oxidation-reduction potential (ORP), and temperature of aqueous samples. The YSI instrument does not measure turbidity. A separate turbidity meter (i.e., Hanna Turbidity Meter) will need to be used in conjunction with the YSI meter. The operator's manual should be consulted for detailed operating procedures.

II. Equipment and Materials

- Water Quality Parameter Meter such as a Horiba® U-22 Water Quality Monitoring System or YSI with flow-though cell
- Auto-Calibration Standard Solution (provided by rental company)
- Distilled water in squirt bottle

III. Procedures and Guidelines

A. Parameters and Specifications:

Parameter	Range of measurement	Accuracy
pH	0 to 14 pH units	+/- 0.1 pH units
Specific conductance	0 to 9.99 S/m	+/- 3 % full scale
Turbidity	0 to 800 NTU	+/- 5 % full scale
Dissolved oxygen	0 to 19.99 mg/l	+/- 0.2 mg/l
Temperature	0 to 55 ^{o}C	+/- 1.0 ^{o}C
ORP	-999 to +999 mV	+/- 15 mV
Salinity	0 to 4 %	+/- 0.3 %

B. Calibration:

Prior to each day's use, clean the probe and flow-through cell using deionized water and calibrate using the Standard Solution.

<u>Horiba U22 Calibration procedure:</u>

1. Fill a calibration beaker with standard solution to the recommended fill line.
2. Insert the probe into the beaker. All the parameter sensors will now be immersed in the standard solution except the D.O. sensor; the D.O. calibration is done using atmospheric air.
3. Turn power on and allow some time for the machine to warm-up prior to starting the calibration. When the initial readings appear to stabilize the instrument is ready to calibrate.
4. Press CAL key to put the unit in the calibration mode.
5. Press the ENT key to start automatic calibration. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one by one: pH, COND, TURB, and DO. When the calibration is complete, the readout will briefly show END. The instrument is now calibrated.
6. If the unit is calibrated properly the instrument readings, while immersed in the standard solution, will match the standard solution values provided on the solution container. The typical standard solution values are: pH = 4.0 +/- 3%, conductivity 4.49 mS/cm +/- 3%, and turbidity = 0 NTU +/- 3%.
7. Record the calibration data (e.g. time, instrument ID, solution lot number and expiration date, final calibrated readings, and solution temperature in the field logbook.

<u>YSI Calibration procedure:</u>

1. Press the **On/off** key to display the run screen
2. Press the **Escape** key to display the main menu screen
3. Use the arrow keys to highlight the **Calibrate**
4. Press the **Enter** key. The Calibrate screen is displayed
5. Choose the parameter to calibrate

A. Conductivity Calibration:

This procedure calibrates specific conductance (recommended), conductivity and salinity. Calibrating any one option automatically calibrates the other two.

1) Use the arrow keys to highlight the **Conductivity** selection
2) Press **Enter.** The Conductivity Calibration Selection Screen is displayed.
3) Use the arrow keys to highlight the Specific Conductance selection.
4) Press **Enter.** The Conductivity Calibration Entry Screen is displayed.

5) Place the correct amount of conductivity standard (see Instrument Manual) into a clean, dry or pre-rinsed transport/calibration cup.
6) Carefully immerse the sensor end of the probe module into the solution.
7) Gently rotate and/or move the probe module up and down to remove any bubbles from the conductivity cell.

   NOTE: The sensor must be completely immersed past its vent hole. Using the recommended volumes from the Instrument Manual Calibration Volumes should ensure that the vent hole is covered.
8) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.

   NOTE: Do not overtighten as this could cause damage to the threaded portions.
9) Use the keypad to enter the calibration value of the standard you are using.

   NOTE: Be sure to enter the value in mS/cm at 25°C.
10) Press Enter. The Conductivity Calibration Screen is displayed.
11) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
12) Observe the reading under Specific Conductance. When the reading shows no significant change for approximately 30 seconds, press Enter. The screen will indicate that the calibration has been accepted and prompt you to press Enter again to Continue.
13) Press Enter. This returns you to the Conductivity Calibrate Selection Screen
14) Press Escape to return to the calibrate menu.
15) Rinse the probe module and sensors in tap or purified water and dry.

B. Dissolved Oxygen Calibration:

This procedure calibrates dissolved oxygen. Calibrating any one option (% or mg/L) automatically calibrates the other.

1) Go to the calibrate screen as described in Section

   NOTE: The instrument must be on for at least 20 minutes to polarize the DO sensor before calibrating.
2) Use the arrow keys to highlight the Dissolved Oxygen selection.
3) Press Enter. The dissolved oxygen calibration screen is displayed.
4) DO calibration in mg/L is carried out in a water sample which has a known concentration of dissolved oxygen (usually determined by a Winkler titration).
5) Use the arrow keys to highlight the DO mg/L selection.
6) Press Enter. The DO mg/L Entry Screen is displayed.
7) Place the probe module in water with a known DO concentration.

   NOTE: Be sure to completely immerse all the sensors.
8) Use the keypad to enter the known DO concentration of the water.
9) Press Enter. The Dissolved Oxygen mg/L Calibration Screen is displayed.
10) Stir the water with a stir bar, or by rapidly moving the probe module, to provide fresh sample to the DO sensor.
11) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.

12) Observe the DO mg/L reading, when the reading is stable (shows no significant change for approximately 30 seconds), press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
13) Press **Enter**. This returns you to the DO calibration screen.
14) Press **Escape** to return to the calibrate menu.
15) Rinse the probe module and sensors in tap or purified water and dry.

C. *pH Calibration:*

1) Go to the calibrate screen.
2) Use the arrow keys to highlight the **pH** selection.
3) Press **Enter**. The pH calibration screen is displayed.
   - Select the **1-point** option only if you are adjusting a previous calibration. If a 2-point or 3-point calibration has been performed previously, you can adjust the calibration by carrying out a one point calibration. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select only one pH buffer.
   - Select the **2-point** option to calibrate the pH sensor using only two calibration standards. Use this option if the media being monitored is known to be either basic or acidic. For example, if the pH of a pond is known to vary between 5.5 and 7, a two-point calibration with pH 7 and pH 4 buffers is sufficient. A three point calibration with an additional pH 10 buffer will not increase the accuracy of this measurement since the pH is not within this higher range.
   - Select the **3-point** option to calibrate the pH sensor using three calibration solutions. In this procedure, the pH sensor is calibrated with a pH 7 buffer and two additional buffers. The 3-point calibration method assures maximum accuracy when the pH of the media to be monitored cannot be anticipated. The procedure for this calibration is the same as for a 2-point calibration, but the software will prompt you to select a third pH buffer.
4) Use the arrow keys to highlight the **2-point** selection.
5) Press **Enter**. The pH Entry Screen is displayed.
6) Place the correct amount of pH buffer into a clean, dry or pre-rinsed transport/calibration cup.

   NOTE: For maximum accuracy, the pH buffers you choose should be within the same pH range as the water you are preparing to sample.

   NOTE: Before proceeding, ensure that the sensor is as dry as possible. Ideally, rinse the pH sensor with a small amount of buffer that can be discarded. Be certain that you avoid cross-contamination of buffers with other solutions.
7) Carefully immerse the sensor end of the probe module into the solution.
8) Gently rotate and/or move the probe module up and down to remove any bubbles from the pH sensor.

   NOTE: The sensor must be completely immersed. Using the recommended volumes from Table 6.1 Calibration Volumes, should ensure that the sensor is covered.
9) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.

NOTE: Do not overtighten as this could cause damage to the threaded portions.

10) Use the keypad to enter the calibration value of the buffer you are using **at the current temperature**.

    NOTE: pH vs. temperature values are printed on the labels of all YSI pH buffers.

11) Press **Enter**. The pH calibration screen is displayed.
12) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
13) Observe the reading under pH, when the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
14) Press **Enter**. This returns you to the Specified pH Calibration Screen.
15) Rinse the probe module, transport/calibration cup and sensors in tap or purified water and dry.
16) Repeat steps 6 through 13 above using a second pH buffer.
17) Press **Enter**. This returns you to the pH Calibration Screen.
18) Press **Escape** to return to the calibrate menu.
19) Rinse the probe module and sensors in tap or purified water and dry.

D. ORP Calibration:

1) Go to the calibrate screen.
2) Use the arrow keys to highlight the **ORP** selection..
3) Press **Enter**. The ORP calibration screen is displayed.
4) Place the correct amount of a known ORP solution into a clean, dry or pre-rinsed transport/calibration cup.

    NOTE: Before proceeding, ensure that the sensor is as dry as possible. Ideally, rinse the ORP sensor with a small amount of solution that can be discarded. Be certain that you avoid cross-contamination with other solutions.

5) Carefully immerse the sensor end of the probe module into the solution.
6) Gently rotate and/or move the probe module up and down to remove any bubbles from the ORP sensor.

    NOTE: The sensor must be completely immersed.

7) Screw the transport/calibration cup on the threaded end of the probe module and securely tighten.
8) Use the keypad to enter the correct value of the calibration solution you are using at the current temperature.
9) Press **Enter**. The ORP calibration screen is displayed.
10) Allow at least one minute for temperature equilibration before proceeding. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
11) Observe the reading under ORP, when the reading shows no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted and prompt you to press **Enter** again to Continue.
12) Press **Enter**. This returns you to the Calibrate Screen.
13) Rinse the probe module and sensors in tap or purified water and dry.

Record the calibration data (e.g. time, instrument ID, solution lot number and expiration date, final calibrated readings, and solution temperature in the field logbook.

C. Sample Measurement:

<u>Horiba U22 measurement procedure:</u>

As water passes through the flow-through the flow cell, press MEAS to obtain reading; record data in a field notebook.

<u>YSI measurement procedure:</u>

As water passes through the flow-through the flow cell, the readings are displayed for each parameter. Record the water quality parameter data in a field notebook. In addition, the data is recorded in the YSI and can be downloaded to a computer following completion of the sampling event.

IV. Key Checks and Preventive Maintenance

- Calibrate meter
- Clean probe with deionized water when done
- Refer to operations manual for recommended maintenance and troubleshooting
- Check batteries, and have a replacement set on hand
- Due to the importance of obtaining these parameters, the field team should have a spare unit readily available in case of an equipment malfunction.

V. References

YSI 556 Multi Probe System Operator Manual

STANDARD OPERATING PROCEDURE - 007

Water-Level Measurements

I. Purpose and Scope

The purpose of this procedure is to provide a guideline for the measurement of the depth to groundwater in piezometers and monitoring wells, even where a second phase of floating liquid (e.g., gasoline) is encountered, and on staff gages in surface-water bodies. This SOP includes guidelines for discrete measurements of static water levels and does not cover the use of continuously recording loggers (see SOP *Use of Data Loggers and Pressure Transducers)*.

II. Equipment and Materials

- Electronic water-level meter (Solinst® or equivalent) with a minimum 100-foot tape; the tape should have graduations in increments of 0.01 feet or less
- Interface probe (Solinst® Model 122 Interface Meter or equivalent)

III. Procedures and Guidelines

Verify that the unit is turned on and functioning properly. Slowly lower the probe on its cable into the piezometer or well until the probe just contacts the water surface; the unit will respond with a tone or light signal. Note the depth from a reference point indicated on the piezometer or well riser. Typically this is the top of the PVC casing. If no reference is clearly visible, measure the depth to water from the northern edge of the PVC casing. If access to the top of the PVC casing is difficult, sight across the top of the locking casing adjacent to the measuring point, recording the position of the cable when the probe is at the water surface.

Measure the distance from this point to the closest interval marker on the tape, and record the water level reading in the logbook. Water levels will be measured to the nearest 0.01-foot. Also when specified in the project plans, measure and record the depth of the piezometer or well. The depth of the piezometer or well may be measured using the water-level probe with the instrument turned off.

Free product light or dense nonaqueous phase liquid may be present in the piezometer or well. If the presence of free product is suspected, the thickness of the product should be determined using appropriate equipment (e.g., Solinst® Model 122 Interface Meter). The depth to water also is determined with this equipment and the water-level meter should not be used in the piezometer or well as long as product is present. Typically, a constant sound is emitted from the device when free product is encountered and an alternating on/off beep sound is emitted when water is encountered.

The apparent elevation of the water level in the well or piezometer is determined by measuring both the apparent depth to water and the thickness of free product. The corrected water-level elevation is calculated by the following equation:

$$WL_c = Wl_a + (\text{Free-product thickness} \times 0.80)$$

Where WL_c = Corrected water-level elevation

Wl_a = Apparent water-level elevation

0.80 = Typical value for the density of petroleum hydrocarbon products.

If free product is detected on the surface of the water in the piezometer or well, the value of sampling should be reconsidered because of the potential for contaminating the sampling equipment.

Staff gages may be installed in some surface-water bodies. These facilities typically are constructed by attaching a calibrated, marked staff gage to a wood or metal post, driving the post into the bottom of the surface-water body, and surveying the elevation of the top of the post to a resolution or 0.01-foot. The elevation of the water in the surface-water body then can be determined by reading off the distance the water level is from the top of the post. A shield or other protection may be needed to calm the fluctuations in water level if the gage is installed at a location exposed to wind or wave.

IV. Attachments

None.

V. Key Checks

- Before each use, verify that the battery is charged by pressing the test button on the water-level meter.
- Verify that the unit is operating correctly by testing the probe in distilled or de-ionized water. Leave the unit turned off when not in use.

STANDARD OPERATING PROCEDURE - 008

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II or lab grade water)
- Millipore™ deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

A. Decontaminate all sampling equipment that has come in contact with sample according to SOP *Decontamination of Personnel and Equipment.*

B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used, remove the disposable tubing after sampling but before decon. When decon is complete, put a 3- to 5-foot segment of new tubing onto the pump to collect the equipment blank.

D. To collect a field blank, slowly pour ASTM Type II or lab grade water directly into sample containers.

E. Document and ship samples in accordance with the procedures for other samples.

F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II or lab grade water.

Chain-of-Custody

I Purpose

The purpose of this SOP is to provide information on chain-of-custody procedures to be used under the CLEAN Program.

II Scope

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities (except wellhead samples taken for measurement of field parameters). Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. This procedure identifies the necessary custody records and describes their completion. This procedure does not take precedence over region specific or site-specific requirements for chain-of-custody.

III Definitions

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under one's custody if:

- It is in one's actual possession.
- It is in one's view, after being in one's physical possession.
- It was in one's physical possession and then he/she locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

IV Responsibilities

Project Manager - The Project Manager is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that other, approved procedures are developed. The Project Manager is responsible for development of documentation of procedures which deviate from those presented herein. The Project Manager is responsible for ensuring that chain-of-custody procedures are implemented. The Project Manager also is responsible for determining that custody procedures have been met by the analytical laboratory.

Field Team Leader - The Field Team Leader is responsible for determining that chain-of-custody procedures are implemented up to and including release to the shipper or laboratory. It is the responsibility of the Field Team Leader to ensure that these procedures are implemented in the field and to ensure that personnel performing sampling activities have been briefed and trained to execute these procedures.

Sample Personnel - It is the responsibility of the field sampling personnel to initiate chain-of-custody procedures, and maintain custody of samples until they are relinquished to another custodian, the sample shipper, or to a common carrier.

V Procedures

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is valid. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom, as well as providing security for the evidence as it is moved and/or passed from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain-of-possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

V.1 Sample Identification

The method of identification of a sample depends on the type of measurement or analysis performed. When *in situ* measurements are made, the data are recorded directly in bound logbooks or other field data records with identifying information.

Information which shall be recorded in the field logbook, when in-situ measurements or samples for laboratory analysis are collected, includes:

- Field Sampler(s),
- Contract Task Order (CTO) Number,
- Project Sample Number,

- Sample location or sampling station number,
- Date and time of sample collection and/or measurement,
- Field observations,
- Equipment used to collect samples and measurements, and
- Calibration data for equipment used

Measurements and observations shall be recorded using waterproof ink.

V.1.1 Sample Label

Samples, other than for *in situ* measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling and Analysis Plan. Each sample container is identified by a sample label (see Attachment A). Sample labels are provided, along with sample containers, by the analytical laboratory. The information recorded on the sample label includes:

- Project - CTO Number.
- Station Location - The unique sample number identifying this sample.
- Date - A six-digit number indicating the day, month, and year of sample collection (e.g., 01/21/08).
- Time - A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- Medium - Water, soil, sediment, sludge, waste, etc.
- Sample Type - Grab or composite.
- Preservation - Type and quantity of preservation added.
- Analysis - VOA, BNAs, PCBs, pesticides, metals, cyanide, other.
- Sampled By - Printed name of the sampler.
- Remarks - Any pertinent additional information.

Using only the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing the analysis from knowing the identity of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site). The field team should always follow the sample ID system prepared by the project EIS and reviewed by the Project Manager.

V.2 Chain-of-Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed of.

V.2.1 Field Custody Procedures

- Samples are collected as described in the site Sampling and Analysis Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the Chain-of-Custody Record exactly.

- A Chain-of-Custody Record will be prepared for each individual cooler shipped and will include ***only*** the samples contained within that particular cooler. The Chain-of-Custody Record for that cooler will then be sealed in a zip-log bag and placed in the cooler prior to sealing. This ensures that the laboratory properly attributes trip blanks with the correct cooler and allows for easier tracking should a cooler become lost during transit.

- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once downloaded to the server or developed, the electronic files or photographic prints shall be serially numbered, corresponding to the logbook descriptions; photographic prints will be stored in the project files. To identify sample locations in photographs, an easily read sign with the appropriate sample/location number should be included.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions (e.g., a logbook notation would explain that a pencil was used to fill out the sample label if the pen would not function in freezing weather.)

V.2.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. **A Chain-of-Custody Record Form must be completed for each cooler and should include only the samples contained within that cooler**. A Chain-of-Custody Record Form example is shown in Attachment B. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as given below:

- Enter header information (CTO number, samplers, and project name).
- Enter sample specific information (sample number, media, sample analysis required and analytical method grab or composite, number and type of sample containers, and date/time sample was collected).
- Sign, date, and enter the time under "Relinquished by" entry.
- Have the person receiving the sample sign the "Received by" entry. If shipping samples by a common carrier, print the carrier to be used in this space (i.e., Federal Express).
- If a carrier is used, enter the airbill number under "Remarks," in the bottom right corner;
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in a plastic zipper-type bag or other appropriate sample-shipping package. Retain the copy with field records.
- Sign and date the custody seal, a 1-inch by 3-inch white paper label with black lettering and an adhesive backing. Attachment C is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals shall be provided by the analytical laboratory.
- Place the seal across the shipping container opening (front and back) so that it would be broken if the container were to be opened.
- Complete other carrier-required shipping papers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the shipping container (enclosed with other documentation in a plastic zipper-type bag). As long as custody forms are sealed inside the shipping container and the custody seals are intact, commercial carriers are not required to sign the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

VI Quality Assurance Records

Once samples have been packaged and shipped, the Chain-of-Custody copy and airbill receipt become part of the quality assurance record.

VII Attachments

A. Sample Label
B. Chain of Custody Form
C. Custody Seal

VIII References

USEPA. *User's Guide to the Contract Laboratory Program*. Office of Emergency and Remedial Response, Washington, D.C. (EPA/540/P-91/002), January 1991.

Attachment A

Example Sample Label

QAL

Quality Analytical Laboratories, Inc.
2567 Fairlane Drive
Montgomery, Alabama 36116
PH. (334)271-2440

Client ______

Sample No. ______

Location ______

Analysis ______

Preservative HCL ______

Date ______ By ______

CEIMIC CORPORATION

10 Dean Knauss Drive, Narragansett, R.I. 02882 • (401) 782-8900

SITE NAME	**DATE**
ANALYSIS	**TIME**
	PRESERVATIVE

SAMPLE TYPE

☐ Grab ☐ Composite ☐ Other ______

COLLECTED BY:

Attachment B

Example Chain-of-Custody Record

CH2M H[illegible]
APPLIED S[illegible]ENCES LABORATORY

CHAIN OF CUSTODY [illegible]ORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # □□□□□□□□.□□.□□

Purchase Order #

Project Name

Company Name CH2M HILL Office

Project Manager & Phone #
Mr. [ ]
Ms. [ ]
Dr. [ ]

Report Copy to:

Requested Completion Date:

Sampling Requirements: SDWA □ NPDES □ RCRA □ OTHER ____

Sample Disposal: Dispose □ Return □

OF CONTAINERS

LAB TEST CODES

ANALYSES REQUESTED

SHADED AREA– FOR LAB USE ONLY

Lab 1 #	Lab 2 #
Quote #	Kit Request #
Project #	
No. of Samples	Page of
Login	LIMS Ver

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	ANALYSES REQUESTED	REMARKS	LAB 1 ID	LAB 2 ID

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	QC Level: 1 2 3 Other: ____	
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	COC Rec	ICE
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	Ana Req	TEMP
				Cust Seal	Ph
Received By (Please sign and print name)	Date/Time	Shipped Via UPS BUS Fed-Ex Hand Other ____	Shipping #		
Work Authorized By (Please sign and print name)	Remarks				

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client
REV 3/94 FORM 340

Attachment C

Example Custody Seal

CH2M HILL

CUSTODY SEAL

Date

Signature

STANDARD OPERATING PROCEDURE - 010

Packaging and Shipping Procedures for Low-Concentration Samples

I. Purpose and Scope

The purpose of this guideline is to describe the packaging and shipping of low-concentration samples of various media to a laboratory for analysis.

II. Scope

The guideline only discusses the packaging and shipping of samples that are anticipated to have low concentrations of chemical constituents. Whether or not samples should be classified as low-concentration or otherwise will depend upon the site history, observation of the samples in the field, odor, and photoionization-detector readings.

If the site is known to have produced high-concentration samples in the past or the sampler suspects that high concentrations of contaminants might be present in the samples, then the sampler should conservatively assume that the samples cannot be classified as low-concentration. Samples that are anticipated to have medium to high concentrations of constituents should be packaged and shipped accordingly.

If warranted, procedures for dangerous-goods shipping may be implemented. Dangerous goods and hazardous materials pose an unreasonable risk to health, safety, or property during transportation without special handling. As a result only employees who are trained under CH2M HILL Dangerous Goods Shipping course may ship or transport dangerous goods. Employees should utilize the HAZMAT ShipRight tool on the Virtual Office and/or contact a designated CH2M HILL HazMat advisor with questions.

III. Equipment and Materials

- Coolers
- Clear tape
- "This Side Up" labels
- "Fragile" labels
- Vermiculite
- Ziplock bags or bubble wrap
- Ice
- Chain-of-Custody form (completed)
- Custody seals

IV. Procedures and Guidelines

Low-Concentration Samples

A. Prepare coolers for shipment:

- Tape drains shut.
- Affix "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of each cooler.
- Place mailing label with laboratory address on top of coolers.
- Fill bottom of coolers with about 3 inches of vermiculite or absorbent pads.

B. Arrange decontaminated sample containers in groups by sample number. Consolidate VOC samples into one cooler to minimize the need for trip blanks.

C. Affix appropriate adhesive sample labels to each container. Protect with clear label protection tape.

D. Seal each sample bottle within a separate ziplock plastic bag or bubble wrap, if available. Tape the bag around bottle. Sample label should be visible through the bag.

E. Arrange sample bottles in coolers so that they do not touch.

F. If ice is required to preserve the samples, cubes should be repackaged in zip-lock bags and placed on and around the containers.

G. Fill remaining spaces with vermiculite or absorbent pads.

H. Complete and sign chain-of-custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express or the courier.

J Close lid and latch.

K. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.

L. Tape cooler shut on both ends, making several complete revolutions with strapping tape. Cover custody seals with tape to avoid seals being able to be peeled from the cooler.

M. Relinquish to Federal Express or to a courier arranged with the laboratory. Place airbill receipt inside the mailing envelope and send to the sample documentation coordinator along with the other documentation.

Medium- and High-Concentration Samples:

Medium- and high-concentration samples are packaged using the same techniques used to package low-concentration samples, with potential additional restrictions. If applicable, the sample handler must refer to instructions associated with the shipping of dangerous goods for the necessary procedures for shipping by Federal Express or other overnight carrier. If warranted, procedures for dangerous-goods shipping may be implemented. Dangerous goods and hazardous materials pose an unreasonable risk to health, safety, or property during transportation without special handling. As a result only employees who are trained under CH2M HILL Dangerous Goods Shipping course may ship or transport dangerous goods. Employees should utilize the HAZMAT ShipRight tool on the Virtual Office and/or contact a designated CH2M HILL HazMat advisor with questions.

V. Attachments

None.

VI. Key Checks and Items

- Be sure laboratory address is correct on the mailing label
- Pack sample bottles carefully, with adequate vermiculite or other packaging and without allowing bottles to touch
- Be sure there is adequate ice
- Include chain-of-custody form
- Include custody seals

Multi RAE Photoionization Detector (PID)

I. Purpose

The purpose of this SOP is to provide general reference information for using the Multi RAE PID in the field. Calibration and operation, along with field maintenance, will be included in this SOP.

II. Scope

This procedure provides information on the field operation and general maintenance of the Multi RAE PID PID. Review of the information contained herein will ensure that this type of field monitoring equipment will be properly utilized. Review of the owner's instruction manuals is a necessity for more detailed descriptions.

III. Definitions

Carbon Monoxide Sensor (CO) - Expresses the Carbon Monoxide concentration in ppm.

Volatile Organic Compound (VOC) – Expresses the VOC concentration in ppm

Lower Explosive Limit (LEL) - Combustible gas is expressed as a percent of the lower explosive limit.

Hydrogen Sulfide Sensor (H_2S) - Expresses the Hydrogen Sulfide concentration in ppm.

Oxygen Sensor (OXY) - Expresses the Oxygen concentration as a percentage.

ppm - parts per million: parts of vapor or gas per million parts of air by volume.

IV. Responsibilities

Project Manager - The Project Manager is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that other approved procedures are developed. The Project Manager is responsible for selecting qualified individuals for the monitoring activities.

Health and Safety Coordinator - The Health and Safety Coordinator is responsible for developing a site-specific Health and Safety Plan (HASP) which specifies air monitoring requirements.

Field Team Leader - It is the responsibility of the Field Team Leader to implement these procedures in the field, and to ensure that the field team performing air monitoring activities have been briefed and trained to execute these procedures before the start of site operations.

Safety Coordinator-Hazard Worker (SC-HW)- The SC-HW is responsible for ensuring that the specified air monitoring equipment is on site, calibrated, and used correctly by the field personnel. The SC-HW will coordinate these activities with the Field Team Leader if the SC-HW is not the Field Team Leader as well.

Field team - It is the responsibility of the field team to follow these procedures or to follow documented project-specific procedures as directed by the Field Team Leader/ Safety Coordinator-Hazard Worker. The field personnel are responsible for documenting all air monitoring results in the field logbook during each field investigation.

V. Procedures

The Multi RAE utilizes the principle of detecting sensors. The PID operates on the principle that most organic compounds and some inorganic compounds are ionized when they are bombarded by high-energy ultraviolet light. These compounds absorb the energy of the light, which excites the molecules and results in a loss of electron and the formation of a positively charged ion. The number of ions formed and the ion current produced is directly proportional to mass and concentration. The amount of energy required to displace an electron is called ionization potential (IP). The air sample is drawn into a UV lamp using a pump or a fan. The energy of the lamp determines whether a particular chemical will be ionized. Each chemical compound has a unique ionizing potential. When the UV light energy is greater than the ionization potential of the chemical, ionization will occur. When the sample is ionized, the electrical signal is displayed on an analog or digital output. Although the output does not distinguish between chemicals, it does detect an increase in the ion current. If only one chemical is present in the air, it is possible to use PIDs quantitatively. Chemical structure and lamp intensity affects the sensitivity of the instrument to a given contaminant. All PID readings are relative to the calibration gas, usually isobutylene. It is important to calibrate the PID in the same temperature and elevation that the equipment will be used, and to determine the background concentrations in the field before taking measurements. For environments where background readings are high, factory zero calibration gas should be used.

The following subsections will discuss Multi RAE calibration, operation, and maintenance. These sections, however, do not take the place of the instruction manual.

A. Calibration

For Multi RAE configured with O_2, LEL, H_2S, CO, sensors and a 10.6eV PID Lamp.

Start up Instrument

- Press **Mode** button

- Observe displays:

On!……..

Multi RAE Version X.XX

Model Number SN XXXX

Date Time Temp

Checking Sensor Ids….

VOC Installed

CO Installed

H_2S Installed

OXY Installed

LEL Installed

H_2S VOC CO LEL OXY

Alarm Limits=

XX XX.X XX XX High XX.X

XX XX.X XX XX Low XX.X

XX XX.X XX STEL

XX XX.X XX TWA

Battery = X.XV Shut off at 4.2V

User Mode=

Alarm Mode=

Datalog Time Left

Datalog Mode

Datalog Period

Unit ready in….. 10 Seconds

- The pump will start, the seconds will count down to zero, and the instrument will be ready for use

Calibration Check and Adjustment

Allow instrument to warm up for 15 minutes.

- Depress the **[N/-]** key first, then while depressing the **[N/-]**, depress the **[Mode]** key also and depress both keys for 5 seconds.
- Display will read:

Calibrate Monitor?

- Press the **[Y/+]** key
- Display will read:

Fresh Air Calibration?

- If "Zero Air" is necessary, attach the calibration adapter over the inlet port of the Multi RAE Monitor and connect the other end of the tube to the gas regulator (HAZCO loaner regulator LREG.5, RAE Systems P/N 008-3011 or suitable .5 LPM regulator) on the Zero Air bottle (HAZCO P/N SGZA, RAE P/N 600-0024). If no Zero Air is available, perform the Fresh Air Calibration in an area free of any detectable vapor.
- Press the **[Y/+]** key
- Display will read:

Zero…. In progress…

CO Zeroed! Reading = X

VOC Zeroed! Reading = X

LEL Zeroed! Reading = X

OXY Zeroed! Reading = X

Zero Cal done!
H_2S Zeroed! Reading = X

In each of the above screens, "X" is equal to the reading of the sensor before it was zeroed.

- Display will then read:

Multiple Sensor Calibration?

- Press the **[Y/+]** key
- The display shows all of the pre-selected sensors and the "OK?" question:

CO H_2S LEL OK? OXY

- Apply calibration gas – use either HAZCO Services Part Number R-SGRAE4 or Rae Systems Part Number 008-3002 – using a .5 LPM regulator and direct tubing.
- Press the **[Y/+]** key. Display will read:

Apply Mixed gas

Calibration In progress …

- The display will count down showing the number of remaining seconds:

CO cal'ed Reading=50

H_2S cal'ed Reading=25

LEL cal'ed Reading=50

OXY cal'ed Reading=20.9

Calibration done Turn off gas!

- Display will read:

Single Sensor Calibration?

- Press the **[Y/+]**.
- Display will read:

CO VOC H_2S LEL pick? OXY

- Attach 100 ppm Isobutylene (HAZCO P/N r-SGISO or Rae P/N 600-0002) using a 1.0 LPM regulator (HAZCO P/N LR10HS or Rae P/N 008-3021). Open regulator.
- Press the **[Mode]** key once, the V of VOC will be highlighted.
- Press the **[Y/+]**. The display will read:

Apply VOC Gas

Calibration In progress…

- The display will count down showing the number of remaining seconds:, then display:

VOC cal'd Reading=100

Calibration done Turn off gas!

Single Sensor Calibration?

- Press **[Mode]** key twice to return to main screen.
- **CALIBRATION IS COMPLETE!**

B. Operation

Due to the Multi RAE having many functions in terms of operation, it is recommended that you follow the operational procedures as outlined in the instruction manual from pages 9 to 14.

C. Site Maintenance

After each use, the meter should be recharged and the outside of the instruments should be wiped clean with a soft cloth.

D. Scheduled Maintenance

<u>Function</u>	<u>Frequency</u>
Check alarm and settings	Monthly/before each use

Clean screens and gaskets around sensors	Monthly
Replace sensors	Biannually or when calibration is unsuccessful

VI. Quality Assurance Records

Quality assurance records will be maintained for each air monitoring event. The following information shall be recorded in the field logbook.

- Identification - Site name, date, location, CTO number, activity monitored, (surface water sampling, soil sampling, etc), serial number, time, resulting concentration, comments and identity of air monitoring personnel.
- Field observations - Appearance of sampled media (if definable).
- Additional remarks (e.g, Multi RAE had wide range fluctuations during air monitoring activities.)

VII. References

Multi RAE Plus Multiple Gas Monitor User Manual, RAE Systems, Revision B1, November 2003.

STANDARD OPERATING PROCEDURE - 012

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water or lab-grade DI water)
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) Liquinox® (or Alconox®)and water solution
- Concentrated (V/V) pesticide grade methanol (DO NOT USE ACETONE)
- Large plastic pails or tubs for Liquinox® and water, scrub brushes, squirt bottles for Liquinox® solution, methanol and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Personal Protective Equipment as specified by the Health and Safety Plan
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. PERSONNEL DECONTAMINATION

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in Liquinox® solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with Liquinox® solution, remove, and discard into DOT-approved 55-gallon drum.

2. Wash outer gloves in Liquinox® solution, rinse, remove, and discard into DOT-approved 55-gallon drum.

3. Remove disposable coveralls ("Tyveks") and discard into DOT-approved 55-gallon drum.

4. Remove respirator (if worn).

5. Remove inner gloves and discard.

6. At the end of the work day, shower entire body, including hair, either at the work site or at home.

7. Sanitize respirator if worn.

B. SAMPLING EQUIPMENT DECONTAMINATION—GROUNDWATER SAMPLING PUMPS

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.

2. Spread plastic on the ground to keep equipment from touching the ground

3. Turn off pump after sampling. Remove pump from well and remove and dispose of tubing. Place pump in decontamination tube.

4. Turn pump back on and pump 1 gallon of Liquinox® solution through the sampling pump.

5. Rinse with 1 gallon of 10% methanol solution pumped through the pump. (DO NOT USE ACETONE).

6. Rinse with 1 gallon of tap water.

7. Rinse with 1 gallon of deionized water.

8. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.

9. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.

10. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

C. SAMPLING EQUIPMENT DECONTAMINATION—OTHER EQUIPMENT

Reusable sampling equipment is decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Before entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with Liquinox® solution.
5. Rinse with potable water.
6. Rinse with distilled or potable water and methanol solution (DO NOT USE ACETONE).
7. Air dry.
8. Rinse with deionized water.
9. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
10. Collect all rinsate and dispose of in a DOT-approved 55-gallon drum.
11. Decontamination materials (e.g., plastic sheeting, tubing, etc.) that have come in contact with used decontamination fluids or sampling equipment will be disposed of in DOT-approved 55-gallon drums.

D. HEALTH AND SAFETY MONITORING EQUIPMENT DECONTAMINATION

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with Liquinox® solution, then a towel wet with methanol solution, and finally three times with a towel wet with distilled water. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

E. SAMPLE CONTAINER DECONTAMINATION

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with Liquinox® solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN SEALED. Repeat the above steps using potable water.
2. Dispose of all used paper towels in a DOT-approved 55-gallon drum.

F. HEAVY EQUIPMENT AND TOOLS

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Facility
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of Liquinox®, methanol, and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

Decontamination of Drilling Rigs and Equipment

I. Purpose and Scope

The purpose of this guideline is to provide methods for the decontamination of drilling rigs, downhole drilling tools, and water-level measurement equipment. Personnel decontamination procedures are not addressed in this SOP; refer to the site safety plan and SOP *Decontamination of Personnel and Equipment*. Sample bottles will not be field decontaminated; instead they will be purchased with certification of laboratory sterilization.

II. Equipment and Materials

- Portable steam cleaner and related equipment
- Potable water
- Phosphate-free detergent such as Liquinox®
- Buckets
- Brushes
- Methanol, pesticide grade
- Personal Protective Equipment as specified by the Health and Safety Plan
- ASTM–Type II grade water or Lab Grade DI Water
- Aluminum foil

III. Procedures and Guidelines

A. Drilling Rigs and Monitoring Well Materials

Before the onset of drilling, after each borehole, before drilling through permanent isolation casing, and before leaving the site, heavy equipment and machinery will be decontaminated by steam cleaning at a designated area. The steam-cleaning area will be designed to contain decontamination wastes and waste waters and can be an HDPE-lined, bermed pad. A pumping system will be used to convey decontaminated water from the pad to drums.

Surface casings may be steam cleaned in the field if they are exposed to contamination at the site prior to use.

B. Downhole Drilling Tools

Downhole tools will be steam cleaned before the onset of drilling, prior to drilling through permanent isolation casing, between boreholes, and prior to leaving the site. This will include, but is not limited to, rods, split spoons or similar samplers, coring equipment, augers, and casing.

Before the use of a sampling device such as a split-spoon sampler for the collection of a soil sample for physical characterization, the sampler shall be cleaned by scrubbing with a detergent solution followed by a potable water rinse.

Before the use of a sampling device such as a split-spoon sampler for the collection of a soil sample for chemical analysis, the sampler shall be decontaminated following the procedures outlined in the following subsection.

C. Field Analytical Equipment

1. Water Level Indicators

   Water level indicators that consist of a probe that comes into contact with the groundwater must be decontaminated using the following steps:

   a. Rinse with tap water
   b. Rinse with de-ionized water
   c. Solvent rinse with methanol
   d. Rinse with de-ionized water

2. Probes

   Probes, for example, pH or specific ion electrodes, geophysical probes, or thermometers that would come in direct contact with the sample, will be decontaminated using the procedures specified above unless manufacturer's instructions indicate otherwise. For probes that make no direct contact, for example, OVM equipment, the probe will be wiped with clean paper-towels or cloth wetted with methanol.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- The effectiveness of field cleaning procedures may be monitored by rinsing decontaminated equipment with organic-free water and submitting the rinse water in standard sample containers for analysis.

STANDARD OPERATING PROCEDURE - 014

Disposal of Waste Fluids and Solids

I. Purpose and Scope

This SOP describes the procedures used to dispose of hazardous fluid and solid materials generated as a result of the site operations. This SOP does not provide guidance on the details of Department of Transportation regulations pertaining to the transport of hazardous wastes; the appropriate Code of Federal Regulations (49 CFR 171 through 177) should be referenced. Also, the site investigation-derived waste management plan should be consulted for additional information and should take precedence over this SOP.

II. Equipment and Materials

A. Fluids

- DOT-approved 55-gallon steel drums or Baker® Tanks
- Tools for securing drum lids
- Funnel for transferring liquid into drum
- Labels
- Paint Pens
- Marking pen for appropriate labels
- Seals for 55-gallon steel drums

B. Solids

- DOT-approved 55-gallon steel drums or rolloffs
- Tools for securing drum lids
- Paint Pens
- Plastic sheets
- Labels
- Marking pen for appropriate labels

III. Procedures and Guidelines

A. Methodology

Clean, empty drums or rolloffs or Baker® Tanks will be brought to the site by the drilling subcontractor for soil and groundwater collection and storage. The empty drums will be located at the field staging area and moved to drilling locations as required. The drums will be filled with the drilling and well installation wastes, capped, sealed, and moved to the onsite drum storage area by the drilling subcontractor. The full drums will separate types of wastes by media. The drums will be labeled as they are filled in the field and labels indicating that the contents are pending analysis affixed.

The drum contents will be sampled to determine the disposal requirements of the drilling wastes. The drum sampling will be accomplished through the collection and submittal of composite samples, one sample per 10 drums containing the same media. Similar compositing will be performed in each rolloff to obtain a representative sample. The compositing of the sample will be accomplished by collecting a specific volume of the material in each drum into a large sample container. When samples from each of the drums being sampled in a single compositing are collected, the sample will be submitted for TCLP, ignitability, corrosivity, and reactivity analysis. The analysis will be used to determine if drilling wastes are covered by land disposal restrictions.

If rolloffs are used, compositing and sampling of soil will comply with applicable state and federal regulations.

B. Labels

Drums and other containers used for storing wastes from drilling operations will be labeled when accumulation in the container begins. Labels will include the following minimum information:

- Container number
- Container contents
- Origin (source area including individuals wells, piezometers, and soil borings)
- Date that accumulation began
- Date that accumulation ended
- Generator Contact Information
- When laboratory results are received, drum labels will be completed or revised to indicate the hazardous waste constituents in compliance with Title 40 of the Code of Federal Regulations, Part 262, Subpart C if the results indicate hazardous waste or labeled as non-hazardous if applicable.

C. Fluids

Drilling fluids generated during soil boring and groundwater discharged during development and purging of the monitoring wells will be collected in 55-gallon, closed-top drums. When a drum is filled, the bung will be secured tightly. Fluids may also be transferred to Baker® Tanks after being temporarily contained in drums to minimize the amount of drums used.

When development and purging is completed, the water will be tested for appropriate hazardous waste constituents. Compositing and sampling of fluids will comply with applicable state and federal regulations.

D. Solids

The soil cuttings from well and boring drilling will constitute a large portion of the solids to be disposed of.

The solid waste stream also will include plastic sheeting used for decontamination pads, Tyveks, disposable sampling materials, and any other disposable material used during the field operations that appears to be contaminated. These materials will be placed in designated drums.

E. Storage and Disposal

The wastes generated at the site at individual locations will be transported to the drum storage area by the drilling services subcontractor. Drums should be stored on pallets on plastic sheeting with a short berm wall (hay bales or 2 x 4 planks or equivalent) to capture small spills.

Waste solid materials that contain hazardous constituents will be disposed of at an offsite location in a manner consistent with applicable solid waste, hazardous waste, and water quality regulations. Transport and disposal will be performed by a commercial firm under subcontract.

The liquid wastes meeting acceptable levels of discharge contamination may be disposed of through the sanitary sewer system at the site. However, prior to disposal to the sanitary sewer system, approval and contract arrangements will be made with the appropriate authorities. Wastes exceeding acceptable levels for disposal through the sanitary sewer system will be disposed of through contract with a commercial transport and disposal firm.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

- Check that representative samples of the containerized materials are obtained.
- Be sure that all state and federal regulations are considered when classifying waste for disposal.

STANDARD OPERATING PROCEDURE - 015

Direct-Push Soil Sample Collection

I. Purpose

To provide a general guideline for the collection of soil samples using direct-push (e.g., Geoprobe®) sampling methods.

II. Scope

Standard direct-push (e.g., Geoprobe®) soil sampling methods.

III. Equipment and Materials

- Truck-mounted hydraulic percussion hammer
- Sampling rods
- Sampling tubes and acetate liners
- Pre-cleaned sample containers and stainless-steel sampling implements
- Personal Protective Equipment as specified by the Health and Safety Plan

IV. Procedures and Guidelines

1. Decontaminate sampling tubes and other non-dedicated downhole equipment in accordance with SOP *Decontamination of Personnel and Equipment*.

2. Drive sampling tube to the desired sampling depth using the truck-mounted hydraulic percussion hammer. If soil above the desired depth is not to be sampled, first drive the lead rod, without a sampling tube, to the top of the desired depth.

3. Remove the rods and sampling tube from the borehole and remove the sampling tube from the lead rod.

4. Cut open the acetate liner using a specific knife designed to slice the acetate liners (see below).

5. Fill all sample containers, beginning with the containers for VOC analysis, using a decontaminated or dedicated sampling implement. For the VOC samples, place the sample into a pre-preserved VOA vial or direct sample container such as an **En Core®** sampler and seal the cap tightly. Ideally, the operation should be completed in one minute. Label the vials and place on ice for shipment to the laboratory.

6. Decontaminate all non-dedicated downhole equipment (rods, sampling tubes, etc.) in accordance with SOP *Decontamination of Personnel and Equipment*.

7. Backfill borehole at each sampling location with grout or bentonite and repair the surface with like material (bentonite, asphalt patch, concrete, etc.), as required.

V. Key Checks and Items

1. Verify that the hydraulic percussion hammer is clean and in proper working order.

2. Ensure that the direct-push operator thoroughly completes the decontamination process between sampling locations.

3. Verify that the borehole made during sampling activities has been properly backfilled.

Appendix C
Navy CLEAN Data Management Plan

Version 3

Navy CLEAN
Data Management Plan

Prepared for

Navy CLEAN & Joint Venture Programs

July 2011

CH2MHILL

Preface

This document presents the standardized six-step workflow process for environmental data management being performed for the Navy Comprehensive Long-Term Environmental Action - Navy (CLEAN) and Joint Venture Programs. Following are the six steps in the workflow process:

1. Project planning and database setup
2. Sample collection and management
3. Laboratory analysis
4. Data validation
5. Data management
6. Data evaluation and reporting

Figure P-1 presents a simplified presentation of the workflow process specific to the Navy CLEAN and Joint Venture Programs.

Figure P-2 presents the tools used in each step of the process. CH2M HILL uses the Sample Tracking Sheet (STS) to initiate the sample collection, documentation, and tracking processes. All field-related data is captured in the Field Data Entry Tool (FDETool). During the laboratory analysis and data validation phase, the SNEDD-QC-Tool software will be used to help evaluate the quality of the data. At the data management step, the SVMTool will be used to format the data and the Navy CHIMPTool will be used to transfer the data into the Navy CLEAN data warehouse. At the data evaluation stage, the Navy XTabReports Tool will be used to query data from the data warehouse, and the Crosstab Cleanup Tool (CCTool) and the Raw, Detects, and Exceedance (RDE) Formatting Tool will produce and format data tables and comparisons to project action levels. Appropriate section(s) of the DMP include additional details on each of the tools used.

Change Management

This DMP is a "living" document and content may be revised or amended to accommodate changes in the scope of environmental investigations or data management requirements that affect the entire Navy CLEAN and Joint Venture Programs. In addition, the DMP appendices will be subject to modification as new or improved methods of data management are developed and implemented.

Any modifications made to the tools will be communicated to the project team via e-mail. As revisions are finalized, they will be distributed electronically to all users. After revision, it is the user's responsibility to conform to revised portions of the DMP.

Amendments will be versioned and released according to the following naming scheme: [Document Name_v#.#_yymmdd]. If a significant change is made to any of these files, the version number will increase by one integer. The revision history is shown in the following table.

REVISION HISTORY
Navy CLEAN and Joint Venture Programs Data Management Plan

Revision Date	Initiator	Purpose

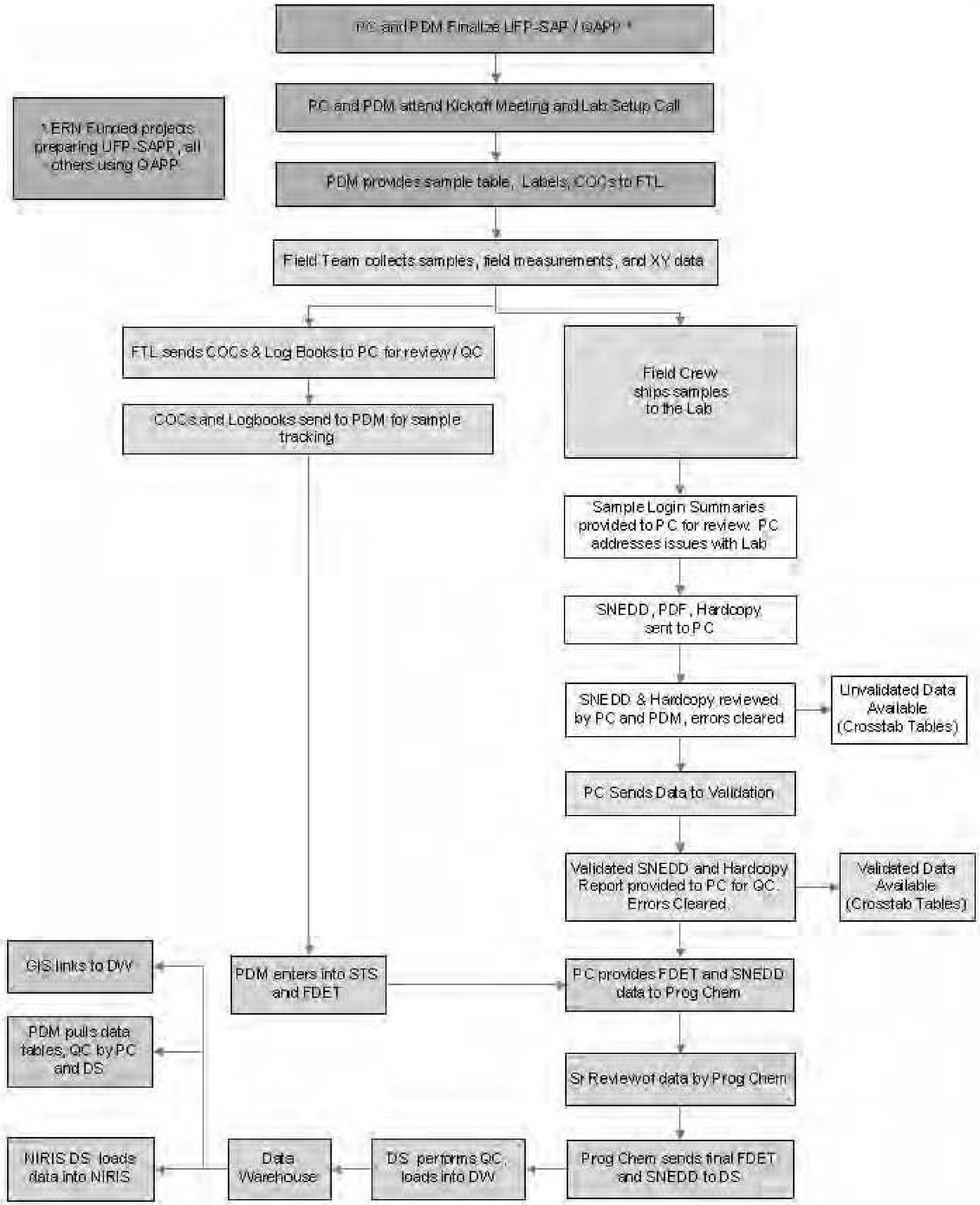
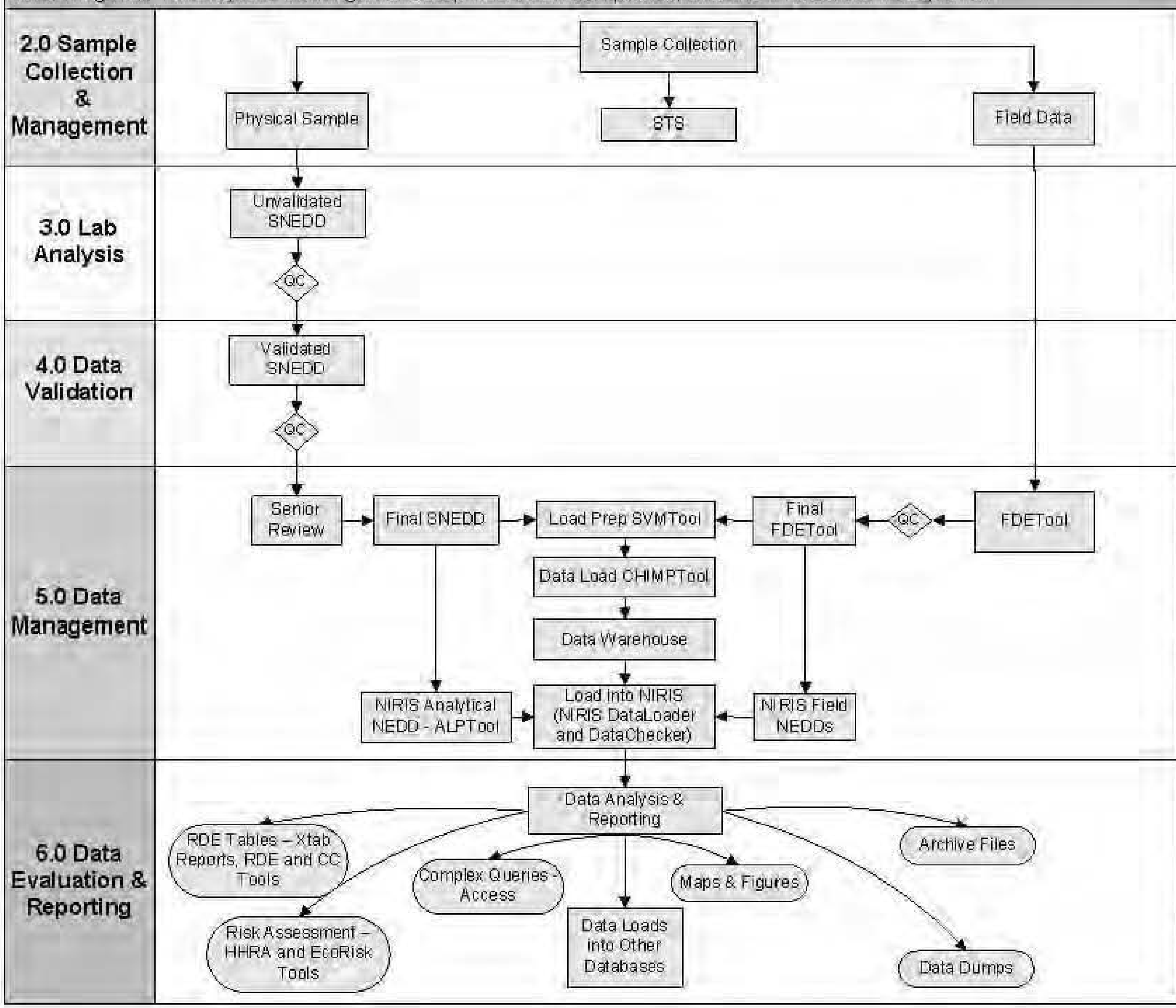


FIGURE P-1
ENVIRONMENTAL DATA MANAGEMENT WORKFLOW PROCESS

NAVY CLEAN DATA MANAGEMENT Tool Workflow

Assuming that 1.0 Project Planning and Setup has been completed, and the Process is ready to run



DEFINITION OF TOOLS

STS: Sample Tracking Sheet. Excel table holds sampling event details.

SNEDD: Supplemental NIRIS Electronic Data Deliverable. Excel file of analytical data.

FDETool: Field Data Entry Tool. Access-based tool that holds of the field-related data.

SVMTool: SNEDD to VDMS Mapping Tool. Access-based tool that links SNEDD and FDET to create DW load files.

CHIMPTool: CH2M Hill Importer Tool. Access-based tool that loads data to DW.

NIRIS DataLoader: Access-based tool that processes and formatts NEDD files for submittal to NIRIS.

DataChecker: Web-based NIRIS tool that performs QC of submitted data and submittal to NIRIS RDM.

Xtab Reports Tool: Crosstab Tool. Access-based tool to pull crosstab tables from DW.

CCTool: Crosstab Cleanup Tool: Excel-based tool that removes automatic formatting of crosstab tables from Xtab Reports Tool.

RDE Tool: Raw, Detects, and Exceedance Formatting Tool. Excel-based tool reformats crosstab tables to Navy CLEAN format.

FIGURE P-2
TOOL WORKFLOW PROCESS

Contents

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Acronyms and Abbreviations

ALPTool	Archive Load and Prep Tool
AM	Activity Manager
CAD	Computer-Aided Design
COC	Chain-of-Custody
CH-IMPTool	CH2M Hill Importer Tool
DBMS	Database Management System
DS	Database Specialist
DMP	Data Management Plan
EDD	Electronic Data Deliverable
EDM	Environmental Data Management
EMS	Enterprise Management Solutions
ERP	Environmental Restoration Program
ERPIMS	Environmental Restoration Program Information Management System
FD	Field Duplicate
FDETool	Field Data Entry Tool
FTL	Field Team Leader
GA	GIS Analyst
GIS	Geographic Information System
ID	Identification
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N/FD	Normal/Field Duplicate
NAVFAC	Naval Facilities Engineering Command
NEDD	NIRIS Electronic Data Deliverable
NIRIS	Naval Installation Restoration Information Solution

NIRIS DS	Naval Installation Restoration Information Solution Database Specialist
ODBC	Open Database Connectivity
PC	Project Chemist
PDM	Project Data Manager
PGL	Program GIS Lead
PM	Project Manager
Prog Chem	Program Chemist
QA	Quality Assurance
QC	Quality Control
RDM	Regional Database Manager
RPM	Regional Project Manager
SDG	Sample Delivery Group
SIMS	Site Information Management System
SNEDD	Supplemental NIRIS Electronic Data Deliverable
SOP	Standard Operating Procedure
STS	Sample Tracking Sheet
SVMTool	SNEDD to VDMS Mapping Tool
VDMS	Validated Data Management System
XTab	Crosstab

SECTION 1

Introduction

This Data Management Plan (DMP) describes the methods CH2M HILL will use to manage and present environmental data to support work it is conducting for the Navy CLEAN and Joint Venture Programs. These processes and procedures are part of an overall environmental data management system called the SNEDD Approach to the Validation Data Management System (VDMS), hosted by CH2M HILL.

Project members and any subcontractors supporting program data needs for site characterization and remediation activities can use this DMP. It is a living document that is flexible enough to meet the dynamic needs of the teams and stakeholders. Data management program details and procedures are included in the appendices.

1.1 Purpose

This document outlines how environmental data for the Navy CLEAN and Joint Venture Programs will be obtained and managed using an Enterprise Management Solutions (EMS) approach. The systematic approach will facilitate the retrieval of data from project files and the data warehouse when they are needed, help ensure that the required data are collected and are of the appropriate quality, and help ensure that data records are not lost during transfer to the central program database repository.

1.2 Scope of the Data Management Plan

The scope of the data management activities addressed by this plan includes the following:

- **Roles.** Definition of staff roles and responsibilities.
- **Project Planning and Setup.** Use standard templates and database applications; provide guidance and standard operating procedures (SOPs) for formatting, reviewing, and transferring data collected in the field to the Database Management System (DBMS).
    - **Provide a structured, yet flexible data set.** The DBMS will store all types of environmental data and provides a standard framework for all projects within the Navy CLEAN Program to use. The DBMS is organized and structured, yet flexible enough to allow additional data and data types to be added at any time over the life of the program.
    - **Provide data that are well documented.** The DBMS will retain enough descriptive and source information for technical defensibility and legal admissibility of the data.
- **Sample Collection and Management.** Items that will be captured through standardized forms or applications include chains-of-custody (COCs), field parameter information, groundwater elevation data, and sample tracking records.
- **Laboratory Analysis.** Laboratory data will be reported in the Supplemental Naval Installation Restoration Information Solution (NIRIS) Electronic Data Deliverable (SNEDD)

format specifications that analytical laboratories are required to use to transfer analytical data electronically to CH2M HILL. (Provided to laboratories via a scope of work.) Management and archive procedures will be implemented for hard copy and electronic project documentation.

- **Data Validation.** Internal and external data validation will be conducted in accordance with the appropriate Program and EPA requirements. All deliverables will be subjected to Senior Review quality assurance (QA) and quality control (QC) measures. Management and archive procedures will be implemented for hard copy and electronic project documentation.
- **Data Management.** QA and QC measures will be implemented to provide accurate representation of all data collected and to be stored in the DBMS. QA/QC procedures include restricting data import or entry to specific valid value lists that will not allow incorrect data to be included in the DBMS.
- **Data Evaluation and Reporting.** Reporting and delivery support will be provided from a single DBMS source and allow relatively simple and rapid access to stored data for environmental characterization, report generation, modeling, geographic information system (GIS) mapping, statistical analyses, and risk assessments.
    - **Provide data visualization capabilities.** Data will be accurately represented for use in models, GIS, computer-aided design (CAD), graphics, and other software used for mapping, graphing, charting, analyzing, and displaying environmental data.
    - **Provide the ability to compare data electronically.** Tools will allow the electronic comparison of project data to specific reference or screening criteria.
    - **Provide the ability to transfer data to different formats.** The DBMS will provide the ability to reformat, convert, and transfer the data to any format as required by specific end-user applications.

SECTION 2

Roles and Responsibilities

The Navy CLEAN and Joint Venture Programs Environmental Data Management (EDM) team will work together to properly execute the DMP and ensure that the project objectives and scope are realized. The EDM team is composed of data management, chemistry, and GIS resources. The EDM team is responsible for all aspects of planning, execution, management and reporting environmental of data. Data are derived from sampling events related to investigative and remedial activities for Navy CLEAN and Joint Venture projects.

Responsibilities related to data management and information solutions functions are grouped into roles, as listed in Table 1. The SNEDD DM Process Checklist referenced in Appendix C documents the specific responsibilities associated with each of these roles.

TABLE 1
Navy CLEAN and Joint Venture Environmental Data Management Program Team
The Navy CLEAN Program Data Management Plan

Title	Name/Address	Phone	Fax	E-mail
Navy CLEAN Activity Manager (AM)	Various	Various	Various	Various
Navy CLEAN Project Manager (PM)	Various	Various	Various	Various
Field Team Leader (FTL)	Various	Various	Various	Various
Program Critigen Team Lead	Mike Dierstein 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-671-6216	757-497-6885	mdierste@critigen.com
Database Specialist (DS)	Chelsea Barnes 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6208	757-497-6885	cleigh@critigen.com
NIRIS Database Specialist (NIRIS DS)	Bhavana Reddy 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703- 462-3784	703- 376-5010	breddy@critigen.com
Program Chemist	Anita Dodson 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-671-6218	757-497-6885	adodson@ch2m.com
Project Chemist (PC)	Mike Zamboni 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5111	703-376-5801	mzamboni@ch2m.com
Project Chemist (PC)	Megan Morrison 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5053	703-376-5801	megan.morrison@ch2m.com

TABLE 1
Navy CLEAN and Joint Venture Environmental Data Management Program Team
The Navy CLEAN Program Data Management Plan

Title	Name/Address	Phone	Fax	E-mail
Project Chemist (PC)	Bianca Kleist 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6281	757-497-6885	bkleist@ch2m.com
Project Chemist (PC)	Juan Acaron 3011 S.W. Williston Road. Gainesville, FL 32608	352-384-7002-		juan.acaron@ch2m.com
Project Chemist (PC)	Clairette Campbell 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6335	757-497-6885	clairette.campbell@ch2m.com
Project Data Manager (PDM)	Gwendolyn Buckley 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-8311	757-497-6885	Gbuckle1@ch2m.com
Project Data Manager (PDM)	Victoria Brynildsen 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6252	757-497-6885	vbrynildsen@ch2m.com
Project Data Manager (PDM)	Troy Horn 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-8311	757-497-6885	troy.horn@ch2m.com
Project Data Manager (PDM)	Hillary Ott 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5165	703-376-5801	hillary.ott@ch2m.com

TABLE 1
Navy CLEAN and Joint Venture Environmental Data Management Program Team
The Navy CLEAN Program Data Management Plan

Title	Name/Address	Phone	Fax	E-mail
Program GIS Lead (PGL)	Mike Dierstein 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6216	757-497-6885	mdierstein@critigen.com
GIS Analyst (GA)	Blake Hathaway 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6230	757-497-6885	bhathawa@critigen.com
GIS Analyst (GA)	Mary Beth Artese 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6228	757-497-6885	martese@critigen.com
GIS Analyst (GA)	Mark Unwin 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6261	757-497-6885	munwin@critigen.com
GIS Analyst (GA)	Chris Bowman 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6276	757-497-6885	cbowman@critigen.com
GIS Analyst (GA)	Matt Rissing 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6243	757-497-6885	mrissing@critigen.com
GIS Analyst (GA)	Forrest Cain 5700 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757-671-6271	757-497-6885	fcain@critigen.com
GIS Analyst (GA)	Jeremy Quan 9191 South Jamaica St Englewood, CO 80112	720-286-0738	720-286-9168	jquan@critigen.com

SECTION 3

Data Management System Description

During field investigation, monitoring, and remedial activities, CH2M HILL will collect a variety of environmental information to support data analysis, reporting, and decision-making activities. To meet current regulatory QA requirements, a complete audit trail of the information flow must be implemented. The six steps in the workflow process are (Appendix B):

1. Project planning and database setup
2. Sample collection and management
3. Laboratory analysis
4. Data validation
5. Data management and loading
6. Data evaluation and reporting

Each step in the data management process must be adequately planned, executed, and documented. Figure 1 presents a simplified presentation of the workflow process specific to the Navy CLEAN and Joint Venture Programs. Figure 2 presentsthe tools used in each step of the process.

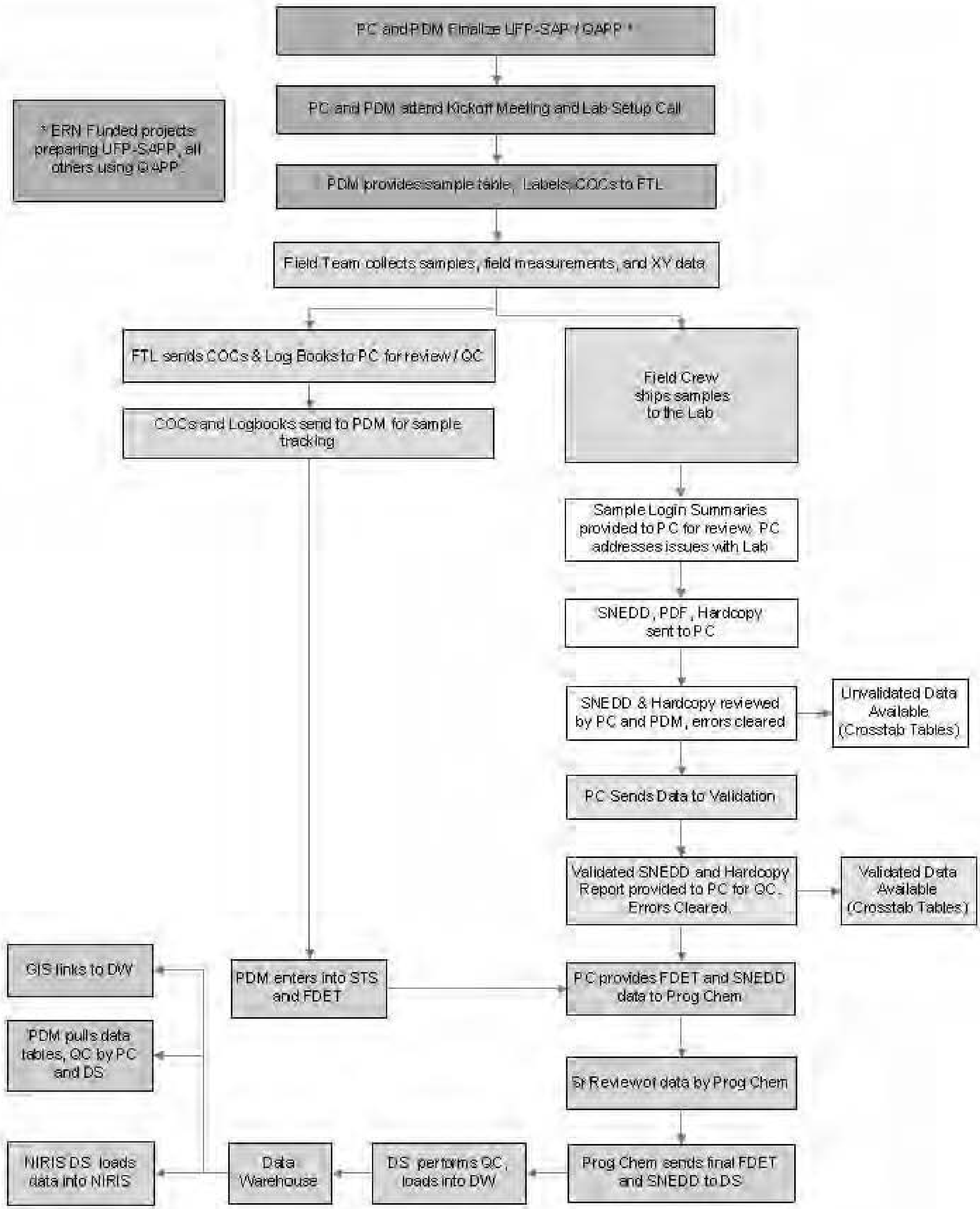

FIGURE 1
ENVIRONMENTAL DATA MANAGEMENT WORKFLOW PROCESS

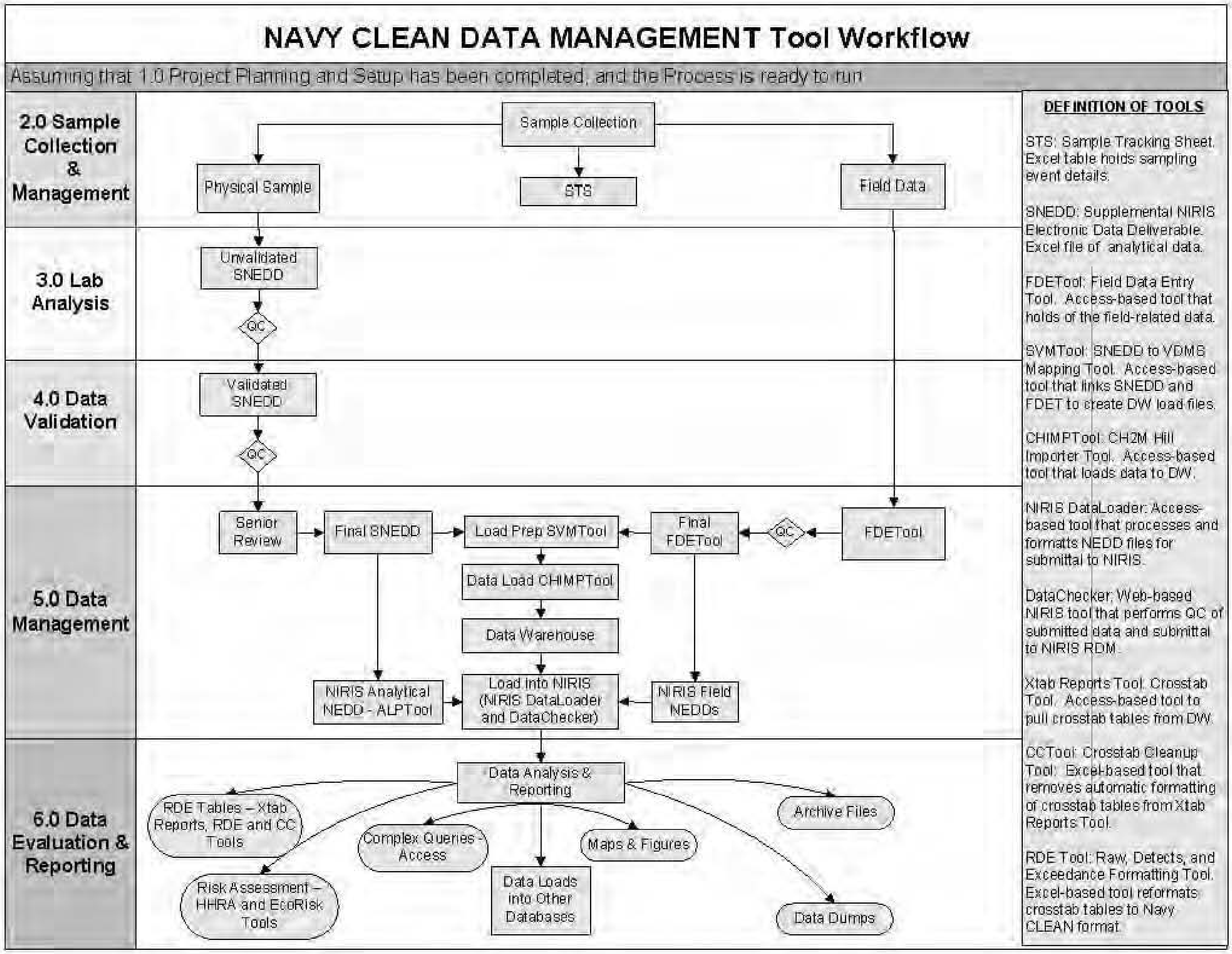

FIGURE 2
DBMS PROCESS

SECTION 4

Phases of Data Management

4.1 Project Planning and Setup

Project planning starts when a new project or task is identified in the program. Evaluation of what is required from data management and visualization occurs to determine the data needs. The Program Critigen Team Lead (Critigen Lead) works with the Database Specialist (DS) and the Project Manager (PM) and/or Activity Manager (AM) to determine what is expected and required from the data management and visualization team. Specific items that should be considered are as follows:

- Inputs – Determine what data will be collected and stored in the database. Determine frequency and quantity. Determine what tools will be used to handle data input.
- Historical Data – This is a unique data input and requires special consideration. The DS ***must*** work with the other technical leads to assess what effort will be required. This step is often missed, and the resulting data quality issues created from inadequate planning in this area can plague the project for its entire duration.
- Outputs – Determine what data will need to be presented in reports, figures, and electronic deliverables. Determine frequency and quality requirements. Determine preliminary data, validated data, and what tools will most effectively handle the output requirements. Discuss how the outputs needed by the team will be requested and documented.
- Visualization – Determine necessity for GIS and CAD.

After the information above is determined, the data management scope, schedule, and budget are developed and endorsed by the Project Manager (PM), DS, Program GIS Lead (PGL) and Program Chemist (Prog Chem). The team can then proceed upon client authorization of the overall project budget. Figure 3 shows the process for project planning.

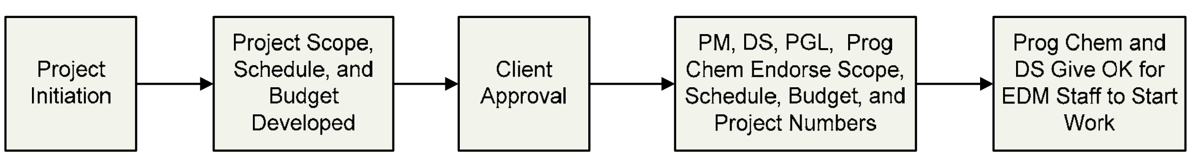

FIGURE 3
PROJECT PLANNING

4.1.1 Database Setup and Administration

CH2M HILL Database

The DS will oversee the administration of the DBMS, including the design, development, and maintenance of the program database, tools and data management processes. Database and data management process design and development will focus on providing rapid data entry and data retrieval while promoting data integrity through various automated procedures. The DS will perform the database maintenance, which consists of the following:

- Assisting with the allocation of sufficient system storage for the program database
- Adding, altering, and deleting users, roles, and privileges
- Periodically defragmenting and compacting the database for more efficient operation
- Upgrading database software and associated applications as necessary
- Maintaining an approved list of valid values for data consistency
- Maintaining redundancy control to ensure that each data record is unique and consistent with conventions
- Performing routine virus checks on incoming and outgoing data

The DBMS is comprised of the Data Warehouse and associated SNEDD-Approach tools, and will support the storage, analysis, display, and reporting of the Navy's environmental, analytical, and geotechnical data. The DBMS will consist of primary data tables that store the environmental data, dependent tables that store more details related to the data in the primary tables, and look-up tables that store valid values to provide input to the primary tables. The PDM will maintain the table content and the DS will manage it. All SNEDD-Approach tools will adhere to version control procedures to ensure that the most current versions and look-up tables are used at all times.

Valid values are critical to any large relational database. Tables 2 and 3 provide examples of valid values for the Navy CLEAN and Joint Venture Programs' sites, stations, and samples. Inconsistencies in naming conventions, subtle analyte or method spelling differences, and the use of non-standard abbreviations can result in lost data and incorrect conclusions. Most tables and forms in the program database will use look-up tables for acceptable valid values and will not allow the entry of data that do not conform.

The primary purpose of managing data in a relational database environment is to ensure that each data record is unique and that the information contained within each field is consistent with conventions defined in other areas of the database. To ensure that each record is unique, a key field or fields will be identified within each data table. The VDMS Data Warehouse architecture supports this approach and eliminates the possibility of data redundancy.

NIRIS Database

All Navy CLEAN and Joint Venture data must be loaded into the Navy's own internal database system, the Naval Installation Restoration Information Solution (NIRIS). NIRIS is a web-based centralized database that has been implemented across all Naval Facilities Engineering Command (NAVFAC) offices and will be used by the Navy and contractors to manage, evaluate, and visualize data, documents and records for Navy and the Marine Corps sites. NIRIS manages all Environmental Restoration Program (ERP) analytical and spatial data, which includes the Munitions Response and Installation Restoration Program (IRP) data, ensuring institutional memory is preserved, land use controls are maintained, and remedial actions are effective.

CH2M HILL will use the SNEDD Approach to VDMS system to track, collect, review, and prepare Navy-related sample and project data for loading into NIRIS. Project data stored in the VDMS Data Warehouse must be consistent and comparable with data that is loaded and stored within NIRIS. As such, all associations between VDMS and NIRIS valid values, output reports, and data tables will be tracked and maintained.

4.1.2 Data Security Procedures

Some SNEDD Approach applications and data are stored in a secure location with login and password protection. Authorized users will have logins and passwords in advance. The DS will provide security access to these tools. Access2003 must be installed on the computer that the user will be using to run these applications, and proper licenses distributed. Files received from any subcontractors will be scanned for common viruses using industry standard, current virus protection programs. The file servers storing the data must be running current virus software, with automatic virus signature updates.

NIRIS data are stored in a secure location with login and password protection. Users who require access to NIRIS and the data contained therein will need to follow procedures outlined in the SOP Access to NIRIS to procure security certificates, training, and access rights to installation-specific data. Authorized users of NIRIS will be assigned logins and passwords maintained by the Navy. For further information on NIRIS or obtaining NIRIS access, consult with the Critigen Lead or DS.

4.1.3 Data Backup and Recovery

All project data management files will reside on CH2M HILL's terminal server, "Gaia," and will have a tape backup or equivalent created in accordance with CH2M HILL's network server management policy.

4.2 Sample Collection and Management

Sample control during the sampling phase is required to ensure the integrity of the associated data. Sample control must be maintained and documented from the point of collection through the point of disposal. Sample control will be managed both in the field and in the laboratory, and will be documented using field logbooks and a Chain of Custody (COC). When custody of a sample is transferred from one party to another, the recipient of the sample assumes responsibility for maintaining control of the sample and documenting that control on the COC. Figure 4 shows the process for planning and executing field sampling events.

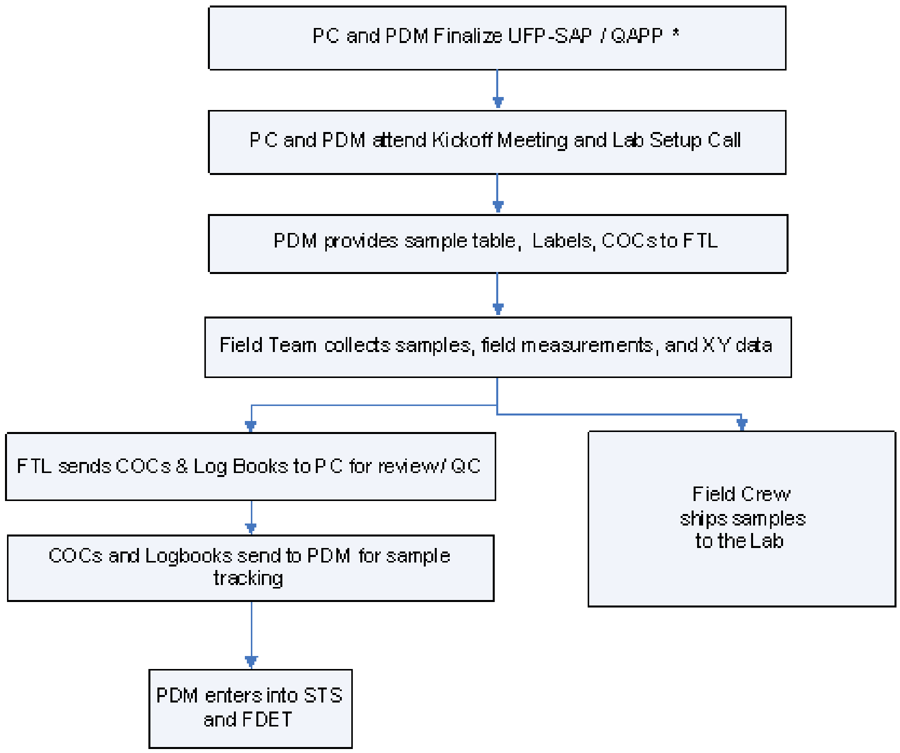

FIGURE 4
FIELD SAMPLING

4.2.1 Sample Tracking Sheet

During the planning stage, the PM specifies the data requirements for the sampling event. The work plan or similar document will provide project-specific data requirements for a given sampling event. The Project Chemist (PC) is responsible for reviewing the Sampling and Analysis Plan and ensuring that the FTL is aware of the number of field and laboratory QC samples required for the sampling event (trip blanks, equipment blanks, field blanks, field duplicates, matrix spikes, and matrix spike duplicates). All of this information is to be entered into the Sample Tracking Sheet (STS).

The STS will be used in advance to identify sampling container and preservation requirements, identify analytical laboratories for samples, aid in the generation of labels for sample bottles before the sampling event, and prepare COC forms after sampling is complete.

4.2.2 Sample Nomenclature Guidelines

The following guidelines are provided for sample nomenclature, COC clarification, and eData expectations.

Station ID (Location)

Field station data are information assigned to a physical location in the field at which some sort of sample is collected. For example, a monitoring well that has been installed will require a name that will uniquely identify it with respect to other monitoring wells or other types of sample locations. The station name provides a key in a database to which any samples collected from that location can be linked to form a relational database structure.

Navy Clean		
First Segment	**Second Segment**	
Facility, Site Number	Station Type	Station Number, Modifier
AA,ANN	AA	NNN_A
Notes: "A"= alphabetic "N"= numeric		

Facility:

A = ABL
AN = Anacostia
BA = Bainbridge
BW = Bloodsworth Island
BR = Bremerton
CA = Cheatham Annex
CH = Cherry Point
CI = Craney Island
CL = Camp Lejeune
CP = Camp Peary
CR = Carderock
DA = Dahlgren
DN = Dam Neck
DR = Driver
IH = Indian Head
LS = Little Creek
NA = Naval Academy
NB = Naval Station Norfolk
NM = NNMC (Bethesda Naval Hospital)
NN = Norfolk Naval Shipyard
NR = Naval Research Laboratory
NWA = Northwest Annex
OC = Oceana
PA = Pax River
PI = Pineros Islands
QU = Quantico
RO = Rota
RR = Roosevelt Roads
SI = Sigonella
SJ = St. Juliens
SS = Sabana Seca
VE = Vieques East
VW = Vieques West
WN = Washington Navy Yard
WO = White Oak
Y = Yorktown

Site/AOC/SWMU Number – Sequential Number:

Site = S01, S02, S03…
Site Screening Area = SA01, SA02, SA03…
AOC = A01, A02, A03…
AOI = AI01, AI02, AI03…
SWMU = W01, W02…
Building = B01, B02, B03…
Range = R01, R02…
LIA – LI Area, East Vieques

BSxx = Background locations outside of site (BS25 = Background Site 25)
BKL = Background locations outside of the facility
BKG = Background locations (inside base)

QC and IDW Stations
Site ID (First Segment) followed by –QC or -IDW

Station Type:
AGT = Above Ground Tank
AS = Ash
BH = Borehole
CO = Concrete
DP = Direct Push
DR = Drill Rig
EW = Extraction Well
FG = Frog
FS = Fish
GB = Geotechnical Boring
GP = Geoprobe
GV = Gas Vent
HP = Holding Pond/Lagoon
IDW = Investigative Derived Waste
IW = Injection Well
LW = Leach Well
MA = Alluvial Monitoring Well
MB = Bedrock Monitoring Well
MU = UST Monitoring Well
MW = Monitoring Well (GW for Y)
PC = Paint Chip
PW = Production Well
QC = Quality Control
RK = Rock
RC = Recovery Well
RM = Remediation Well
RW = Residential Well
SD = Sediment Location
SG = Soil Gas
SL = Storm Sewer Line Sediment
SO = Soil Location
SP = Seep
ST = Storm Water
SU = Sump
SV = Soil Vapor
SW = Surface Water
SWS = Surface Water Body (for SW and SD)
UST = Underground Storage Tank
TA = Tap Water
TD = Tidal Station
TI = Tissue Sample (general)
TO = Tadpole
TP = Test Pit
TR = Trench Sediment
TS = Treatment System
TW = Temporary Well
WA = Alluvial Extraction Well
WB = Bedrock Extraction Well
WL = Water Supply Well
WN = Pore Water
WP = Wipe Sample
WT = Water Table Piezometer

Station Number:
Sequential Station Number (i.e., 01, 02, 03…)

Modifier (used selectively):
D = Deep monitoring well
S = Shallow monitoring well

Example Station IDs:

YS01-DP02 = Direct push soil location #2 at Yorktown Naval Weapons Station Site 1
CHR05-MW02S = Shallow monitoring well location 2, at the Cheatham Annex facility, Range 5.
NMBKL-SD02 = Background sediment location #2 located outside of NNMC
CHBS03-SO05 = Soil location #5, located in reference area outside of Site 3 in Cherry Point
VEW04-QC = QC Station at East Vieques SWMU-4
CAA08-IDW = IDW Station at Cheatham Annex AOC-8

TABLE 2

STATION ID SCHEME

Navy Clean			
First Segment	**Second Segment**	**3rd Segment**	**Fourth Segment**
Site ID Facility, AOC Number	Station/Sample Type, Station Number, Modifier	Depth (As Needed)	Date (MMYY) $_A$
AA,ANN	AANNN$_A$	A	NNNN$_A$
Notes: "A"= alphabetic "N"= numeric			
A = ABL AN = Anacostia BA = Bainbridge BW = Bloodsworth Island BR = Bremerton CA = Cheatham Annex CH = Cherry Point CI = Craney Island CL = Camp Lejeune CP = Camp Peary CR = Carderock DA = Dahlgren DN = Dam Neck DR = Driver IH = Indian Head LS = Little Creek NA = Naval Academy NB = Naval Station Norfolk NM = NNMC (Bethesda Naval Hospital) NN = Norfolk Naval Shipyard NR = Naval Research Laboratory NWA = Northwest Annex OC = Oceana PA = Pax River PI = Pineros Islands QU = Quantico RO = Rota RR = Roosevelt Roads SI = Sigonella SJ = St. Juliens SS = Sabana Seca VE = Vieques East VW = Vieques West WN = Washington Navy Yard WO = White Oak Y = Yorktown <u>Site/AOC/SWMU – Sequential Number:</u> Site = S01, S02, S03… Site Screening Area = SA01, SA02, SA03… AOC = A01, A02, A03… AOI = AI01, AI02, AI03… SWMU = W01, W02… Building = B01, B02, B03… Range = R01, R02… LIA – LI Area, East Vieques BSxx = Background locations outside of site (BS25 = Background Site 25) BKL = Background locations outside of the facility BKG Background locations (inside base)	<u>Sample Type:</u> AGT = Above Ground Tank AH = Air - Headspace AS = Ash BH = Borehole CO = Concrete DR = Drill Rig DS = Direct Push—Soil DW = Direct Push—Groundwater EW = Extraction Well FG = Frog FS = Fish GB = Geotechnical Boring GP = Geoprobe GV = Gas Vent HP = Holding Pond/Lagoon IW = Injection Well LF = Free Product LW = Leach Well MA = Alluvial Monitoring Well MB = Bedrock Monitoring Well MU = UST Monitoring Well MW = Monitoring Well (GW for Y) PC = Paint Chip PW = Production Well RK = Rock SW = Surface Water RC = Recovery Well RM = Remediation Well RW = Residential Well SB = Subsurface Soil SD = Sediment Location SG = Soil Gas SL = Storm Sewer Line Sediment SO = Soil Location (Composite) SP = Seep SS = Surface Soil SSD = Subsurface Sediment ST = Storm Water SU = Sump SV = Soil Vapor SW = Surface Water UST = Underground Storage Tank TA = Tap Water TD = Tidal Station TI = Tissue Sample (general) TO = Tadpole TP = Test Pit TR = Trench Sediment TS = Treatment System TW = Temporary Well WA = Alluvial Extraction Well WB = Bedrock Extraction Well WL = Water Supply Well WN = Pore Water WP = Wipe Sample WT = Water Table Piezometer <u>Station Number:</u> Sequential Number (e.g., 001, 002, 003) <u>Modifier (used selectively):</u> D = Deep monitoring well S = Shallow monitoring well P = Duplicate	<u>Depth</u>: Use only if applicable. A sequential letter is used to reflect varying depths, as actual depths can change in the field after sample planning has occurred. E.g. A, B, C… <u>Sample Number:</u> 1. Duplicate Samples - Use a 'P' modifier in the second segment of the sample ID, directly after the location number to indicate a duplicate sample. E.g. AB01-MW11P-0506 2. MS/MSD Samples – Append a modifier of '-MS' for matrix spike or '-SD' for matrix spike duplicate to the end of the sample ID. 3. QC & IDW Samples (Blank Samples & Waste Char.) - Format consists of Facility, AOC Number, Qualifier Code, Sequential Qualifier Number-Date (AAANN-AANN-MMDDYY). E.g. LSA05-TB02-061106 <u>Qualifier Codes</u>: TB = Trip Blank FB = Field Blank EB = Equipment Blank WQ = Source Blank WS = Waste Char. Soil WW = Waste Char. Water 4. Drill Rig Samples – Format consists of Facility, AOC Number, Station Type, Station Number, Date. E.g. YS12-DR02-020507 5. Multiple samples - Should multiple samples be collected from the same location in a given day/month (affects only samples not differentiated by depth), a sequential letter will be added to the end of the fourth segment (date). E.g. A, B, C…	
<u>Example Sample IDs:</u> <u>WNA01-MW102S-0105A</u> = The first shallow groundwater sample collected at monitoring well location 102 in January 2005 in AOC01 at the Washington Navy Yard facility. <u>PIW01-SW023P-0306</u> = Pineros Island duplicate surface water sample collected at location 23, at SMWU-1 in March 2006. <u>SSW06-FB01-061106</u> = The first field blank collected on June 11, 2006 at SMWU-6 in Sabana Seca.			

TABLE 3

STATION ID SCHEME

Before beginning fieldwork, the FTL will review the proposed level of effort and coordinate a list of unique station identification names, or station IDs, with the DS or PDM. The FTL will be responsible for enforcing the use of the standardized ID system and agreed upon station IDs during all field activities.

Each station will be uniquely identified by an alphanumeric code that will describe the station's attributes. These attributes are facility, Area of Concern (AOC)/Site/Operable Unit (OU) number, station type, sequential station number, and possibly an additional qualifier as needed. The naming scheme to be used for the identification of a sampling station is documented in Table 2.

For example, if the first sample location at next month's event within Yorktown Site 30 is at a soil location, then the location ID could possibly be YS30-SO391 because that was the next available sequence number for soil locations. This should also be reflected in the Sample ID. QC and IDW station IDs must be established for each site that they are associated with.

Please consult with the DS or PDM should any questions arise. This will avoid complications that could occur if a station is mislabelled and ensure there are unique identifiers for every sampling location. Required deviations to this format in response to field conditions will be documented in the field logbook.

Sample ID

Field sample data are information assigned to a physical piece of material collected in the field for which some sort of analysis will be run. Before collecting samples, the FTL will review the proposed level of effort and coordinate a list of unique sample identification names, or sample IDs, with the DS or PDM. The FTL will be responsible for enforcing the use of the standardized ID system and agreed upon sample IDs during all field activities.

Each sample will be uniquely identified by an alphanumeric code that will describe the sample's attributes. These attributes are facility, Area of Concern (AOC)/Site/Operable Unit (OU) number, sample/station type, sequential station number, modifier (as needed), depth (as needed), date, and date modifier (as needed). The naming scheme to be used for the identification of samples is documented in Table 3.

The standardized ID system will identify all samples collected during sampling activities. The system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. For example, a surface soil sample collected from station YS30-SO391 reference above in June of 2009 will result in a sample ID of YS30-SS391-0609.

Please consult with the DS or PDM should any questions arise. This will avoid complications that could occur if a sample is mislabelled and ensure there are unique identifiers for every sample. Required deviations to this format in response to field conditions will be documented in the field logbook.

4.2.3 Sample Collection

A photocopy of each field logbook page completed during sampling and of each COC will be made by the FTL and forwarded to the PC at predefined intervals during sampling events. This information will serve as notification to the PC of samples being shipped to an offsite lab and of the field crew's sampling progress.

Communication with field and laboratory staff will occur daily during the field event. The PC will resolve issues that arise in the field (i.e. bottle ware shortage, equipment failure, etc). The lab will be informed of the shipment dates and the number of coolers or samples being sent. Laboratory login reports will be reviewed by the PC to ensure samples were received in good condition (i.e. no breakage, within holding time, within designated temperature). The field crew and PM will be notified if there were problems with shipment.

4.2.4 Chain-of-Custody

A single COC number per laboratory / cooler should be generated each day (there can be multiple pages to one COC number) and provided to the PC. MSs and MSDs will be requested at a set frequency for each project (usually one per 20 samples collected). MS and MSD samples should not be taken from field duplicates (FDs) or field blanks. FDs will be requested at a set frequency for each project (usually one per 10 samples). FDs should not be taken from MSs, MSDs, or field blanks. The MS and MSD samples listed on the COC should be spiked and analyzed by the laboratory.

A 100% QC will be performed on COCs received from the field crew. The field crew and/or lab will be notified if corrections need to be made to the COCs or lab login reports. Any corrections or modifications made will be noted in a Corrections-To-File Letter.

4.2.5 Sample and Document Tracking

The PDM will update the STS with sample collection and tracking information, and ensure that it is kept current throughout the data management process. All samples collected, resulting deliverables, and deliverable dates will be tracked throughout the data management process to ensure that the project schedule is met and subcontractor invoices are evaluated correctly.

All documentation acquired during the data management process, including Statements of Work (SOWs), Bids, COCs, Field Notes, Sample Tracking Sheets, Login Reports, Corrections-to-File Letters, FDETool QC tables, Post Load Reports, Invoices, and Communication Logs shall be compiled throughout the process to be stored in the appropriate Activity's Project Notebook.

4.2.6 Field Data

Once the field data and samples are collected, necessary field measurements, such as water levels and other data collected in the field should be entered into the FDETool. Any data entered into the FDETool must be exported into an excel file to facilitate a QC review of the data. The correction of any anomalies should be verified with the PM and PC. The information entered into the FDETool will be linked with related analytical data reported in the SNEDD within the SVMTool. Field data and laboratory analytical data are linked by sample ID and date/time. This allows verification analytical results for all samples have been received and reported by the laboratory.

4.3 Laboratory Analysis

Figure 5 shows the laboratory analysis process. Upon receipt of samples from the field, the laboratory will verify that the COC forms correctly identify and detail all samples submitted. Each COC form must be signed with the date and time of receipt by the laboratory. Samples will be logged in by the laboratory using information from the COC forms and the project instructions.

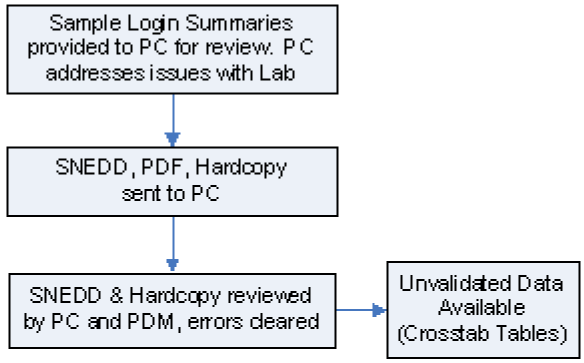

FIGURE 5
LABORATORY ANALYSIS

Samples will be analyzed as specified on the accompanying COC forms and in the Laboratory SOW. Generally, questions or noted inconsistencies identified by the laboratory should be addressed directly to the PC. Login summaries detailing all samples and analyses received by the lab should be provided daily to the PC for review. All discrepancies should be corrected to ensure that all samples are analyzed as per project instructions.

The laboratory will attach the signed COCs to their hard copy data deliverables to officially relinquish control of the data back to the Environmental Contractor within the specified turnaround time. Data archiving forms will be generated and affixed to each laboratory report received per Sample Delivery Group (SDG) for cataloguing, tracking, and archiving purposes.

The Laboratory will provide hard copy data, a PDF of the report, and SNEDDs to the PC. The PC and PDM will concurrently review the data to ensure that they are complete and acceptable as outlined in the Data QC Checklist. A 10% comparison between the hard copy and SNEDD content will be conducted to ensure consistency, resolve discrepancies, and document data error issues (for example, EDD re-submissions, turnaround time problems, hard copy incompleteness). All detected errors should be resolved with the laboratory.

The SNEDD-QC-Tool is used to QC the laboratory's SNEDD. Before the laboratory analytical data is formatted into data tables or sent for validation, the laboratory SNEDD must be processed through CH2M Hill's SNEDD-QC-Tool Microsoft Access database application. The SNEDD-QC-Tool includes several automated diagnostic checks to verify format and content compliance with SNEDD specifications.

Upon SNEDD receipt at CH2M Hill, the PDM will check the SNEDD using the SNEDD-QC-Tool to verify correct format and content. If errors are found, the laboratory will be notified of the errors, and the SNEDD corrected.

These checks ensure the consistency and the validity of the SNEDD and hardcopy content before the data are reported in preliminary tables or sent for validation. The objective of using the SNEDD-QC-Tool is to ensure that the validation process is performed on consistently high-quality data and minimize the chance of finding data errors later in the validation process, which would require the laboratory to resend corrected data and start the validation process over again.

Preliminary raw and detects tables will be generated from data reported in the SNEDD with the SNEDD Crosstab Tool. A separate table must be created for each matrix, and provided to the PM for review.

4.4 Data Validation

Once the preliminary data verification is complete, the PC will prepare the data for validation. The PC will notify the data validator in advance of when to expect data and of any samples or analyses that should not be validated (i.e. grain size should not be validated). For internal data validation, the PDM will provide the unvalidated data tables and a QC Association Table to the PC.

Data validation will be performed in accordance with the Data Validation SOW, UFP SAP, and any other documents required. Generally, questions or noted inconsistencies identified by the validator should be addressed directly to laboratory, with the PC notified of issues and resolutions identified.

4.4.1 External Data Validation

For external data validation, a copy of the SNEDD, hard copy data, and a QC Association Table will be provided to the data validator. The PC will coordinate the return of the data package to CH2M HILL.

Data Validators will provide the following materials to the PC within the required turn around time:

- Hardcopy Data Validation Report
- PDF Copy of the Data Validation Report
- Validated Version of the SNEDD

Once returned to CH2M HILL, the SNEDD will be run through the SNEDD-QC-Tool, which includes automated diagnostic checks for validated data to verify format and content compliance with SNEDD validation specifications. The PC will review the validated data to ensure that they are complete and acceptable as outlined in the Data QC Checklist. A 100% QC check will be performed on the validated results to ensure that the hard copy data matches the SNEDD. All detected errors should be resolved with the data validator.

Data archiving forms will be generated and affixed to each Data Validation Report per SDG received for cataloguing, tracking, and archiving purposes.

Validated raw and detects tables will be generated from data reported in the validated SNEDD with the SNEDD Crosstab Tool. A separate table must be created for each matrix. Unvalidated tables must be reviewed by the PC prior to distribution to the PM.

4.4.2 Internal Data Validation

For internal data validation, a copy of the SNEDD, hard copy data, unvalidated data tables and a QC Association Table will be provided to the PC.

The PC will evaluate QC information, associated validation logic, and apply qualifiers to data in the SNEDD and on the laboratory Form Is when QC criteria are not achieved. Qualifier criteria will be based on the Quality Assurance Project Plan. A hardcopy data validation report will be generated. Data archiving forms will be generated and affixed to each Data Validation Report per SDG validated for cataloguing, tracking, and archiving purposes

Validated raw and detects tables will be generated from data reported in the validated SNEDD with the SNEDD Crosstab Tool. A separate table must be created for each matrix. Unvalidated tables must be reviewed by the PC prior to distribution to the PM.

4.4.3 Unvalidated Data Preload Check

Occasionally, unvalidated data will need to be loaded into the database. Although the data will not be validated, it will undergo a basic Preload Check by the PC to ensure laboratory compliance with project guidelines and determine results to be reported as the best result where multiple runs were conducted for a given sample/analysis. The Prog Chem will provide input and oversight to ensure that data flags are applied correctly by the PC.

4.4.4 Senior Review

The Prog Chem will verify that the final SNEDD and hardcopy data are complete and acceptable. Any identified discrepancies will be resolved with the assistance of the PC, PDM, laboratory, or validator as needed.

4.5 Data Preparation and Loading

Once the data are considered final and approved by the Prog Chem, they are provided to the DS for loading to the project Data Warehouse. Field and laboratory data are merged into a format that is amenable to the warehouse. The backbone is a SQL-server-based data warehouse.

4.5.1 Data Preparation

As part of the normal process of loading data into the warehouse, data standardization tasks must be completed. The DS will load data into the warehouse using the following three programs: SNEDD-QC-Tool, SVMTool and Navy CH-IMPTool.

A final QC of the data reported in the SNEDD is conducted with the SNEDD-QC-Tool. Any identified discrepancies will be resolved with the assistance of the Prog Chem, PC, or PDM as needed. SNEDDs that pass all of the QA/QC checks in the SNEDD-QC-Tool are then processed with the SVMTool.

The SVMTool links the field data contained in the FDETool to the analytical data contained in the SNEDD. A series of logical QC checks are run to ensure that all data links correctly and minimum data requirements are met. The tool then merges the data into a format compatible with the data warehouse structure.

4.5.2 Data Loading

CH2M HILL Loading

The Navy CH-IMPTool runs an additional series of QC checks and adds project-specific formatting, and loads the data into the warehouse. The following tasks need to be completed to load the data for project use:

- **Unit Standardization:** Analytical units and the associated results, reporting limits, and method detection limits will need to be converted to a consistent set of units as required by the project.
- **Resolve Reanalysis and Dilutions:** All samples that had an associated reanalysis or dilution run by the laboratory must have all of the excluded or rejected results marked as not the best result for reporting.
- **Resolve Analytical Overlap and Split Samples:** Analytical overlap occurs when a sample is analyzed by two or more methods that report the same analyte. To resolve any issues not previously resolved, the following logic is used to select the usable result:
  - If the overlapping results are all non-detections, the lowest non-detection result is selected.
  - If the overlapping results are all detected, the highest detected result is selected.
  - If the overlapping results consist of a mixture of detections and non-detections, the highest detected result is selected.

When data are loaded into the warehouse, an automated script will run to identify the "best" result when more than one analytical result exists.

NIRIS Loading

All Navy CLEAN and Joint Venture data must be loaded into NIRIS, with the approval of the installations Regional Project Manager (RPM). Following the successful loading of data into the data warehouse, the NIRIS DS will use the FDETool and ALPTool to generate project NIRIS Electronic Data Deliverables (NEDD) files. Field-related NEDDs will be generated from the final version of the FDETool. The final version of the project SNEDD will be processed through the Archive Load Prep Tool (ALPTool) to generate the analytical NEDD. The NIRIS DS will then use the NIRIS DataLoader Tool to ensure that all NEDDs files are complete and formatted correctly.

The DBS will use NIRIS's Data Checker Loader Tool to QC and submit the project NEDD files into NIRIS. The NIRIS Regional Database Manager (RDM) will load the data into NIRIS, and will work with the NIRIS DS to resolve any potential issue that may arise during loading. Following notification of successful data loading from the RDM, the DBS will query the data from NIRIS for review to ensure data integrity and accuracy.

4.5.3 Data Warehouse

The data warehouse is a Microsoft SQL Server 2005 relational database. This database, and all other SNEDD-Approach tools used, has a data structure designed to achieve compliance with

NIRIS and Navy data reporting standards specified for Navy CLEAN and the Joint Venture Program.

The warehouse will use valid value tables when applying reference attributes to project data. Such reference data include the names of site objects and sampling locations, sampling matrix and method categories, analyte names, units. These reference tables are critical for maintaining the completeness and accuracy of data sets and are essential for accurate querying of the data.

Data are loaded and stored so that relationships among categories of data are enforced. For instance, all sampling records must be associated with a valid site object such as a planned sediment sampling location. The project repository database and collection, analysis, and reporting tools used in the DBMS are designed to enforce, for any project data record, entries in fields that refer to other types of data as required by the overall data model.

4.6 Data Reporting

Data reporting includes the following tasks:

- Retrieving data from the data warehouse for project deliverables, data visualization, or consumption by third parties
- Reviewing initial data and producing data queries and draft reports to dissect and disassemble the data
- Producing any requested client and regulatory agency data deliverables

Data for project deliverables, data visualization, or consumption by third parties will be retrieved from the warehouse, and will be equivalent to the real-time state of the project repository database. PMs and GIS Analysts (GAs) will work with the PDM and DS for quality queries and data for reports.

4.6.1 Tables, Figures, and Diagrams

Once the data have been sufficiently analyzed, the list of requested data reports (tables, figures, diagrams) can be developed and finalized by the project team and submitted to the PM for review.

All requests for figures or graphics are to be directed to the GA assigned as the Point of Contact (POC) for that particular Navy installation. All requests for analytical data (crosstab tables, data dumps, third party deliverables etc) should be directed to the PDM assigned as the POC for that particular Navy installation. The PDM will generate a data deliverable from the data warehouse or NIRIS (as needed) suitable for end use and will provide data support to the end user. All data deliverables generated by the PDM will be reviewed by the PC and DS to ensure accuracy and that request requirements were met. All requests for data statistics and calculations should be directed to the Risk Assessor assigned to the project.

4.6.2 GIS

The Navy CLEAN program will utilize ESRI's suite of GIS software for the majority of GIS-related tasks. The GIS data model will consist of one or more geodatabases (GDBs) per installation. Each installation will maintain one common installation GDB, which will store the common infrastructure data such as buildings, roads, topography, hyrdography, utilities, etc.

The common installation GDB should adhere, as much as possible, to the Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) data model. All project specific GDBs shall be developed and named for ease of interpretation by the GA.

All station location information for each installation will be pulled directly from the data warehouse and stored in the common installation GDB as a data table. The data warehouse must contain valid coordinate information for the locations to be displayed correctly. Valid coordinate information will be maintained in the data warehouse by the PDM, and updated as necessary by the DS.

ESRI's ArcMap 9.3 (or the latest version available) will be utilized for spatially displaying the environmental data within maps and figures, as well as for spatial analysis. The GA will need to coordinate efforts with the PDM on all requests that require the display of environmental sample data on a map to ensure that the appropriate data is queried from the data warehouse and linked to the appropriate station location table within the GIS.

4.6.3 Site Information Management System

This is currently not being used on the Navy CLEAN and Joint Venture Programs.

SIMS is a tool for publishing data of sufficient quality from the project. However, the project data warehouse will remain the database of record for the project.

SIMS provides many standard report formats, all of which are used in conjunction with the Query Tool feature, to isolate and retrieve information. Users can generate and save their queries using a graphical point-and-click tool. Reports in a wide variety of formats also can be requested and produced.

4.6.4 Legacy Data

Legacy data are those collected from any contractor other than CH2M HILL and data collected by CH2M HILL that have not been managed in accordance with Navy CLEAN and Joint Venture Program requirements. Legacy data are commonly compiled from various electronic and hard copy sources including spreadsheets, databases, technical reports, and laboratory hard copy data reports. When working with legacy data, usability assessment must be completed for the project team to be able to use the data with confidence. In order to assess the data properly, the legacy data needs to be evaluated by skilled professionals that are familiar with the type of data being evaluated so that any errors identified in the data can be corrected when possible or qualified in a manner to reflect the limitations of the data's use.

The PM has overall responsibility for the selection for inclusion of legacy data into the data management process. The Prog Chem and DS will work with the PM to establish the data review and import process, compile a comprehensive data inventory, and identify staff to facilitate data review.

The DS will work with the PDM to determine the appropriate intermediary files and tools used to collect the data. The PDM is responsible for assembling the field and laboratory data in formats that facilitate data review. The Prog chem will oversee the data review and flagging process and approve the data for upload into the Data Warehouse. The data will be loaded into the Data Warehouse after approval by the DS and Prog Chem.

The GA, DS, Prog Chem, and PM have the primary responsibility for reviewing the data in their area of expertise and providing the Prog Chem and/or PDM with data usability flags to be associated with each record.

SECTION 5

Project Closeout

The project completion/closeout phase includes the following:

- Archive hard copy and electronic documents
- Conduct project closeout meeting

5.1 Archive Procedures

A large variety of technical data will be generated during the field investigations. The PDM and PC will collect all hard copy and electronic data they are responsible for and verify that the incoming records are legible and in suitable condition for storage. Record storage will be performed in two stages:

- Storage during the project
- Permanent storage following project completion

During the project, CH2M HILL will store data hardcopy reports in CH2M HILL offices. Physical records will be secured in steel file cabinets or shelves, and labelled with the appropriate project identification. Electronic data will be maintained on CH2M HILL's corporate local area network servers.

Information generated from field activities will be documented on appropriate forms and will be maintained in the project file. These include COC records, field logbooks, well construction forms, boring logs, location sketches, and site photographs. In addition, notes from project meetings and telephone conversations will be filed.

Following project completion, both hard copy and electronic data deliverables will be archived. Team staff will provide all hard copies of laboratory and validation reports to the Data Closeout Coordinator to be prepped and shipped to Stone Mountain for archiving. Final laboratory SNEDDs and loading files will be archived on CH2M HILL's corporate local area network servers by the DS.

Any modifications made to the SNEDD-Approach tools, criteria data sets, lookup tables, etc will be communicated to the project team via e-mail. As revisions are finalized, they will be distributed electronically to all users, and old versions will be archived on Gaia. After revision, it is the user's responsibility to conform to revised portions of the DMP.

5.2 Invoice Review and Approval

The PDM is responsible for tracking all data deliverables throughout the data management process to ensure that the project schedule is maintained, subcontractors comply with all required turn around times, and data provided are complete and acceptable. Following project completion, PDMs are to review and provide comments on all laboratory and data validator invoices regarding data quality and schedule compliance prior to approval by the PM.

5.3 Project Closeout

At the end of each project, the PM will notify team staff of project closeout. The PM will coordinate and verify that all pertinent data has been archived. The PM may also review lessons learned, suggest process improvements, or revisions to the DMP and other project documentation as deemed necessary.

Appendix A

Environmental Data Management Work Process

Environmental Data Management Work Process

1.0 Project Planning & Setup	2.0 Sample Collection & Management	3.0 Lab Analysis	4.0 Data Validation	5.0 Data Management	6.0 Data Evaluation & Reporting
1.1 Project Setup	2.1 Sample Management	3.1 Sample Analysis	4.1 Internal Chemical Data Validation	5.1 CH2M HILL Data	6.1 Data Prep & Processing for Reporting
1.2 QAPP, SAP, DMP, DQOs Integration	2.2 Sample Collection	3.2 EDD Management	4.2 External Chemical Data Validation	5.2 Other Contractor & Legacy Data	6.2 Tabular Data Queries & Reports
1.3 Laboratory Setup	2.3 Sample Data Management	3.3 Hard Copy Management	4.3 Senior Review of Validated Data	5.3 Database Maintenance & Administration	6.3 Field Logs and Graphs
1.4 Database Setup					6.4 GIS Queries and Maps

Appendix B
Standard Operating Procedures

The following SOPs can be located on the Ariadne server at the following link:
\\ariadne\Proj\CLEANII\DataMgmt\EIS\Reference Manual\2010

Checklist – Archive and NIRIS Load Prep

Checklist – Data QC

Checklist - PDM Project Start-up Questions

Checklist - Generating RDE Tables

Checklist - Historic Data Cleanup

Checklist - SNEDD DM Process

Roles – Data Management Coordinator

Roles – PDM

Roles – Project Manager

Template – STS & QC Association Table

SOP-114 - CHIMPTool

SOP-126 - XTab Reports Tool

SOP - Access to NIRIS

SOP - Cherry Point Exceedance Formatting Wizard

SOP – CLEAN SNEDD Loading with CHIMPTool

SOP - Corrections to File

SOP - Data Archiving Procedures

SOP - Data Shipping

SOP – FDET

SOP – FDET Setup

SOP – NIRIS Importer Validator Tool

SOP – SVMTool

SOP – Valid Value Setup

Appendix C
Electronic Data Deliverable Specifications

CH2M HILL SNEDD Format			
Field Name	**Field Format**	**REQ**	**Field Description**
Contract_ID	A13	R	Contract ID assigned by Division Contracting Office, not including dashes. Found on Statement of Work. (e.g. D459559365800)
DO_CTO_Number	A4	R	CTO or TO # assigned by Navy. (e.g. CTO-12 = 0012, TO-54 = TO54)
Phase	A8	NR	Task Phase, Annual Quarter, etc (e.g. QTR1)
Installation_ID	A20*	R	Unique identifier for installation. (e.g. WHIDBEY)
Sample_Name	A50	R	CH2M HILL Sample ID (from Chain Of Custody).
CH2M_Code	A4*	R	CH2M HILL Preparation Method Code (e.g. NONS)
Analysis_Group	A9*	R	The CH2M HILL code for the analysis performed on the sample.
Analytical_Method	A20*	R	Analytical Method used to analyze sample fraction. (e.g. 6010)
PRC_Code	A15*	R	NIRIS code for the analytical method category (e.g. PCHAR)
Lab_Code	A10*	R	CH2M HILL Code assigned to laboratory (e.g. COMP)
Lab_Name	A50*	R	The name of the laboratory that conducted the analysis, in all CAPS.
Leachate_Method	A16*	RA	Code for the leachate method used on sample. (e.g. SW1310)
Sample_Basis	A16*	R	Sample basis of analysis; wet weight, dry weight etc. (e.g. DRY)
Extraction_Method	A16*	RA	Code for the extraction method used on sample. (e.g. FLTRES)
Result_Type	A16*	R	Type of results; dilution, reanalysis etc. (e.g. 000)
Lab_QC_Type	A15*	R	Code for Laboratory Sample (MS, MSD, LBLK, LCS)
Sample_Medium	A16*	R	Sample medium reported by the laboratory. (e.g. L)
QC_Level	A16*	R	QC Level of data package : EPA levels I to IV. (e.g. 3)
DateTime_Collected	MM/DD/YYYY 00:00	R	Date and time sample was collected. Use 24 hour clock. (e.g. 02/13/2007 15:34)
Date_Received	MM/DD/YYYY	R	The date the sample was received in the lab (in 10 characters). (e.g. 03/24/2007)
Leachate_Date	YYYYMMDD	RA	Date the sample was leached. Req'd if sample was leached and/or Leachate Method provided. (e.g. March 12, 2007 = 20070312)
Leachate_Time	HH:MM:SS	RA	Time the sample was leached. Use 24 hour clock, with 8 characters. (e.g. 14:30:05). Req'd if sample was leached and/or Leachate Method provided.
Extraction_Date	YYYYMMDD	RA	Date that the lab extracted the sample. Req'd if Extraction Method provided.
Extraction_Time	HH:MM:SS	RA	Time of day lab extracted the sample. Use 24 hour clock, with 8 characters. Req'd if Extraction Method provided. (e.g. 02:15:00)
Analysis_Date	YYYYMMDD	R	Date that the lab performed the analysis.
Analysis_Time	HH:MM:SS	R	Time of day that the lab extracted the sample. Use 24 hour clock, with 8 characters.
Lab_Sample_ID	A20	R	Unique ID assigned to the sample by the laboratory.
Dilution	N10,2	R	Dilution factor used. Default value is 1 (e.g. 10)
Run_Number	N4	R	Number distinguishing multiple or repeat analyses by the same method (incl. RA, RE, DL, etc). Must

CH2M HILL SNEDD Format			
Field Name	**Field Format**	**REQ**	**Field Description**
			be equal to or greater than 1.
Percent_Moisture	N6,3	RA	Percent moisture of the sample. (e.g. 20)
Percent_Lipid	N6,3	RA	Percent lipid of the sample.
Chem_Name	A55*	R	The name of the compound being analyzed.
Analyte_ID	A20*	R	Analyte ID (CAS Number) assigned to the analyte. (e.g. 7440-47-3)
Analyte_Value	N18,7	R	Leave Blank for Validator to enter the final analyte concentration.
Original_Analyte_Value	N18,7	R	Analyte concentration value originally generated by the Laboratory.
Result_Units	A16*	R	Unit of measure for the analyte value. (e.g. UG_L)
Lab_Qualifier	A16*	RA	Lab data qualifier. Values will not be rejected if not in domain table.
Validator_Qualifier	A16*	RA	Leave blank for Validator. Values will not be rejected if not in domain table.
GC_Column_Type	A16*	RA	Data code for the type of GC column used in an analysis.
Analysis_Result_Type	A4*	R	Type of analysis performed (allowed: SURR or TRG).
Result_Narrative	A120	RA	Additional information or comments associated with the result.
QC_Control_Limit_Code	A16*	RA	Type of quality control limit. Req'd if QC criteria and upper/lower accuracy included. (e.g. CLPA)
QC_Accuracy_Upper	N6,3	RA	Upper QC limit of % recovery as measured for a known target analyte spiked into a QC sample. (e.g. 25.45)
QC_Accuracy_Lower	N6,3	RA	Lower QC limit of % recovery as measured for a known target analyte spiked into a QC sample. (e.g. 10.15)
Control_Limit_Date	YYYYMMDD	RA	Date a control limit is established.
QC_Narrative	A120	RA	Leave blank for Validator. Enter DV_Qual_Code.
MDL	N18,7	RA	Method Detection Limit. Required for QSM Version 3.X
Detection_Limit	N18,7	RA	Reported Detection Limit. Required for QSM Version 3.X
QSM_Version	N18,7*	RA	QSM Version of data reported
DL	N18,7	RA	QSM4.1 defined Detection Limit. Required if QSM Version is 4.1 or greater.
LOD	N18,7	RA	QSM4.1 defined Limit of Detection. Required if QSM Version is 4.1 or greater. Non-Detects shall be reported to this value.
LOQ	N18,7	RA	QSM4.1 defined Limit of Quantitation. Required if QSM Version is 4.1 or greater.
SDG	A50	R	Lab code for a group of samples in a data deliverable package.
Analysis_Batch	A20	R	Lab code for a batch of analyses analyzed together.
Validator_Name	A50*	R	Leave Blank. Name of Validator in all CAPS. (e.g. CONTRACTOR INC.)
Val_Date	YYYYMMDD	RA	Populated by Validator/Reviewer. Validation/Review QC date.

Appendix D
Laboratory Accreditation

CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board/ACLASS

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

APPL, Inc.
908 N. Temperance Avenue
Clovis, CA 93611

has been assessed by ACLASS
and meets the requirements of

ISO/IEC 17025:2005 and DoD-ELAP

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1410

Certificate Number

ACLASS Approval

Certificate Valid: 10/23/2011-10/23/2013
Version No. 003 Issued: 12/08/2011

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated January 2009*).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & DoD-ELAP

APPL, Inc.

908 N. Temperance Avenue, Clovis, CA 93611
Diane Anderson Phone: 559-275-2175

TESTING

Valid to: October 23, 2013 Certificate Number: ADE- 1410

I. Environmental

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater	Acid Digestion for Metals Analysis	3010A	
Solid / Solid Waste	Acid digestion for Metals Analysis	3050B	
Water / Wastewater	Mercury Digestion and Analysis	245.1 / 7470A	AAS
Solid / Solid Waste	Mercury Digestion and Analysis	7471B	AAS
Water / Wastewater	Microwave assisted Acid Digestion for Metals Analysis	3015A	Microwave
Solid / Solid Waste	Microwave assisted Acid Digestion for Metals Analysis	3051A	Microwave
Water / Wastewater	Purge and Trap for Aqueous Samples	5030B / 5030C	
Solid / Solid Waste	Closed-system purge and trap extraction for VOA analysis	5035 / 5035A	
Water / Wastewater	Separatory Funnel Extraction	3510C	
Solid / Solid Waste	Ultrasonic Extraction	3550B	Ultrasonic waterbath

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Solid / Solid Waste	Soxhlet Extraction	3540C	Soxhlet Extractors
Water / Wastewater	Liquid-Liquid Extraction	3520C	Liquid-Liquid Extractor
Water / Wastewater / Solid / Solid Waste	Silica gel cleanup	3630C	
Solid / Solid Waste	Incremental sampling	8330B, Appendix A	Puck mill grinder
Water / Wastewater / Solid / Solid Waste	Sulfur cleanup	3660B	
Water / Wastewater / Solid / Solid Waste	Sulfuric acid – permanganate cleanup	3665A	
Water / Wastewater / Solid / Solid Waste	Gel permeation cleanup	3640A	
Solid / Solid Waste	TCLP extraction	1311	Rotary Tumbler
Solid / Solid Waste	SPLP extraction	1312	Rotary Tumbler
Solid / Solid Waste	Waste Extraction Test (WET)	CCR Chapter 11, Article 5, Appendix II	Rotary Tumbler
Water / Wastewater	Total Dissolved Solids	160.1 / 2540C	Gravimetric
Water / Wastewater	Total Suspended Solids	2540D	Gravimetric
Water / Wastewater	Anion analysis	300.0 / 9056 / 9056A	Dionex Ion Chromatography
Solid / Solid Waste	Anion analysis	9056 / 9056A	Dionex Ion Chromatography

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPAunless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater / Solid / Solid Waste	Perchlorate analysis	314.0	Dionex Ion Chromatography
Water / Wastewater / Solid / Solid Waste	Ammonia	350.1	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	TKN	351.2	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	Nitrate / Nitrite	353.2	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	Sulfide	4200S2F	Titrimetric
Drinking Water / Water / Wastewater / Solid / Solid Waste	PCB Congeners	1668A	High Resolution GC/MS
Water / Wastewater / Solid / Solid Waste	Perchlorate	6850	HPLC/Electrospray Ionization/MS
Water / Wastewater	Oil & Grease	1664A	Gravimetric
Water / Wastewater	Oil & Grease	5520B	Gravimetric
Water / Wastewater	TRPH	5520BF	Gravimetric
Water / Wastewater / Solid / Solid Waste	Total Metals	6010B / 6010C	ICP
Water / Wastewater / Solid / Solid Waste	Total Metals	6020 / 6020A	ICP/MS
Water / Wastewater / Solid / Solid Waste	Hexavalent Chromium	7196A	UV/Vis
Solid / Solid Waste	Alkaline digestion of Hexavalent Chromium	3060A	

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MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPAunless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater	Hexavalent Chromium	218.6 / 7199	Dionex Ion Chromatography
Water / Wastewater / Solid / Solid Waste	Total Cyanide Distillation	9010C	Midi-Distillation unit
Water / Wastewater / Solid / Solid Waste	Total Cyanide Analysis	9014	UV/Vis
Water / Wastewater	Corrosivity - pH	9040C	Ion Selective Electrode
Solid / Solid Waste	Corrosivity - pH	9045D	Ion Selective Electrode
Water / Wastewater / Solid / Solid Waste	Chlorinated & Brominated Hydrocarbons	8011	GC/ECD
Water / Wastewater / Solid / Solid Waste	DRO/GRO	8015B/C/D	GC/FID
Water / Solid	OP Pesticides	8141A / 8141B	GC/ECD
Water / Wastewater / Solid / Solid Waste	OCL Pesticides	8081A / 8081B	GC/ECD
Water / Waste Water	PCB	608	GC/ECD
Water / Wastewater / Solid / Solid Waste	PCB	8082 / 8082A	GC/ECD
Water / Wastewater / Solid / Solid Waste	Herbicides	8151A	GC/ECD
Water / Wastewater / Solid / Solid Waste	VOA	8260B / 8260C	GC/MS
Water / Wastewater / Solid / Solid Waste	PAH	8270C SIM / 8270D SIM	GC/MS
Water / Wastewater / Solid / Solid Waste	Semi-VOA	8270C / 8270D	GC/MS

MATRIX	SPECIFIC TEST or GROUP OF ANALYTES**	SPECIFICATION OR STANDARD METHOD (all EPAunless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater / Solid / Solid Waste	Dioxins	8290	HRGC/HRMS
Water / Wastewater / Solid / Solid Waste	Nitroaromatics & Nitramines & Nitroguanadine PGDN Picric Acid	8330A / 8330B / 8321A	HPLC
Water / Wastewater / Solid / Solid Waste	Carbamates	8321A	HPLC
Solid / Solid Waste	Ignitability	1030	
Solid / Solid Waste	TOC	Walkley-Black	Titration
Water	DOC / TOC	5310B / 9060A	TOC Analyzer
Water	Ethane / Ethene / Methane	RSK175	GC / FID
Water	Alkalinity	2320B	Titrimetric
Water	MBAS	5540C	UV/Vis
Water	Electrical Conductance	2510B	EC meter

Notes:

1. ** = As Applicable*
2. *** = Refer to Accredited Analytes Listing for specific analytes in which the laboratory is accredited*
3. *This scope is part of and must be included with the Certificate of Accreditation No. ADE- 1410*

Keith Greenaway

Vice President

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Accredited Analytes/Methods

WP Proficiency Testing Summary

Lab Name : APPL, Inc.

City/State : Clovis, CA

PartName	PartNumber	NELACCode	AnalyteName	EPA Method	PT results
WP Minerals #1	55144	1955	Total Dissolved Solids (TDS)	160.1	Approved
Oil & Grease	4120	1860	Oil & Grease	1664A	Approved
Oil & Grease - n-Hexadecane & Stearic	55084	1860	Oil & Grease	1664A	Approved
PCB Congeners in Water	PEO-403	9070	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	1668A	Approved
PCB Congeners in Water	PEO-403	9025	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	1668A	Approved
PCB Congeners in Water	PEO-403	9040	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	1668A	Approved
PCB Congeners in Water	PEO-403	8980	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	1668A	Approved
PCB Congeners in Water	PEO-403	8955	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	1668A	Approved
PCB Congeners in Water	PEO-403	9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	1668A	Approved
PCB Congeners in Water	PEO-403	9050	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	1668A	Approved
PCB Congeners in Water	PEO-403	9045	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	1668A	Approved
PCB Congeners in Water	PEO-403	8985	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	1668A	Approved
PCB Congeners in Water	PEO-403	9055	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	1668A	Approved
PCB Congeners in Water	PEO-403	9005	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	1668A	Approved
PCB Congeners in Water	PEO-403	8995	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	1668A	Approved
PCB Congeners in Water	PEO-403	9000	2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	1668A	Approved
PCB Congeners in Water	PEO-403	8936	2,4,4'-Trichlorobiphenyl (PCB 28)	1668A	Approved
PCB Congeners in Water	PEO-403	9060	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	1668A	Approved
PCB Congeners in Water	PEO-403	9015	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	1668A	Approved
PCB Congeners in Water	PEO-403	8965	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	1668A	Approved
PCB Congeners in Water	PEO-403	8970	3,4,4',5-Tetrachlorobiphenyl (PCB 81)	1668A	Approved
PCB Congeners in Water	PEO-403	9025	PCB (129)+(138)+(163)	1668A	Approved
PCB Congeners in Water	PEO-403	9040	PCB (153)+(168)	1668A	Approved
PCB Congeners in Water	PEO-403	9046	PCB (156)+(157)	1668A	Approved
PCB Congeners in Water	PEO-403	9070	PCB (180)+(193)	1668A	Approved
PCB Congeners in Water	PEO-403	8936	PCB (20)+(28)	1668A	Approved
PCB Congeners in Water	PEO-403	8980	PCB (90)+(101)+(113)	1668A	Approved
PCB Congeners in Water	PEO-403	8870	PCBs, total	1668A	Approved
WP Hexavalent Chromium	55096	1045	Chromium VI	218.6	Approved
SWA Anions	55131	1540	Bromide	300.0	Approved
WP Minerals #1	55144	1575	Chloride	300.0	Approved
WP & DMRQA Nutrients	55035	1810	Nitrate as N	300.0	Approved
WP & DMRQA Nutrients	55035	1870	Orthophosphate as P	300.0	Approved
WP Nitrate & Nitrite	55130	1810	Nitrate as N	300.0	Approved
WP Nitrate & Nitrite	55130	1820	Nitrite + Nitrate as N	300.0	Approved
WP Nitrate & Nitrite	55130	1840	Nitrite as N	300.0	Approved
WP Minerals #2	55145	1730	Fluoride	300.0	Approved
WP Minerals #2	55145	2000	Sulfate	300.0	Approved
WP Perchlorate	55116	1895	Perchlorate	314.0	Approved
WP & DMRQA Nutrients	55035	1515	Ammonia as N	350.1	Approved
WP & DMRQA Nutrients #2	55064	1795	Total Kjeldahl Nitrogen	351.2	Approved
WP & DMRQA Nutrients	55035	1810	Nitrate as N	353.2	Approved
WP Nitrate & Nitrite	55130	1810	Nitrate as N	353.2	Approved
WP Nitrate & Nitrite	55130	1820	Nitrite + Nitrate as N	353.2	Approved
WP Nitrate & Nitrite	55130	1840	Nitrite as N	353.2	Approved
WP & DMRQA Trace Elements	55024	1000	Aluminum	6010B	Approved
WP Trace Elements	55025	1005	Antimony	6010B	Approved
WP & DMRQA Trace Elements	55024	1010	Arsenic	6010B	Approved
WP Trace Elements	55025	1015	Barium	6010B	Approved
WP Trace Elements	55025	1015	Barium	6010B	Approved
WP Trace Elements	55025	1020	Beryllium	6010B	Approved
WP Trace Elements	55025	1020	Beryllium	6010B	Approved
WP Trace Elements	55025	1025	Boron	6010B	Approved
WP & DMRQA Trace Elements	55024	1030	Cadmium	6010B	Approved
WP Minerals #1	55144	1035	Calcium	6010B	Approved
WP & DMRQA Trace Elements	55024	1040	Chromium	6010B	Approved
WP & DMRQA Trace Elements	55024	1050	Cobalt	6010B	Approved
WP & DMRQA Trace Elements	55024	1055	Copper	6010B	Approved
WP & DMRQA Trace Elements	55024	1070	Iron	6010B	Approved
WP & DMRQA Trace Elements	55024	1075	Lead	6010B	Approved
WP Minerals #1	55144	1085	Magnesium	6010B	Approved
WP & DMRQA Trace Elements	55024	1090	Manganese	6010B	Approved
WP Trace Elements	55025	1100	Molybdenum	6010B	Approved
WP & DMRQA Trace Elements	55024	1105	Nickel	6010B	Approved
WP Minerals #2	55145	1125	Potassium	6010B	Approved
WP & DMRQA Trace Elements	55024	1140	Selenium	6010B	Approved
WP Trace Elements	55025	1150	Silver	6010B	Approved
WP Minerals #2	55145	1155	Sodium	6010B	Approved
WP Trace Elements	55025	1160	Strontium	6010B	Approved
WP Trace Elements	55025	1165	Thallium	6010B	Approved
WP Tin	55095	1175	Tin	6010B	Approved
WP Tin	55095	1175	Tin	6010B	Approved
WP Trace Elements	55025	1180	Titanium	6010B	Approved
WP & DMRQA Trace Elements	55024	1185	Vanadium	6010B	Approved

WP & DMRQA Trace Elements	55024	1190	Zinc	6010B	Approved
NPTA			Zirconium	6010B	Approved
WP & DMRQA Trace Elements	55024	1000	Aluminum	6010C	Approved
WP Trace Elements	55025	1005	Antimony	6010C	Approved
WP & DMRQA Trace Elements	55024	1010	Arsenic	6010C	Approved
WP Trace Elements	55025	1015	Barium	6010C	Approved
WP Trace Elements	55025	1015	Barium	6010C	Approved
WP Trace Elements	55025	1020	Beryllium	6010C	Approved
WP Trace Elements	55025	1020	Beryllium	6010C	Approved
WP Trace Elements	55025	1025	Boron	6010C	Approved
WP & DMRQA Trace Elements	55024	1030	Cadmium	6010C	Approved
	55144	1035	Calcium	6010C	Approved
WP & DMRQA Trace Elements	55024	1040	Chromium	6010C	Approved
WP & DMRQA Trace Elements	55024	1050	Cobalt	6010C	Approved
WP & DMRQA Trace Elements	55024	1055	Copper	6010C	Approved
WP & DMRQA Trace Elements	55024	1070	Iron	6010C	Approved
WP & DMRQA Trace Elements	55024	1075	Lead	6010C	Approved
WP & DMRQA Trace Elements	55024	1090	Manganese	6010C	Approved
WP Trace Elements	55025	1100	Molybdenum	6010C	Approved
WP & DMRQA Trace Elements	55024	1105	Nickel	6010C	Approved
	55145	1125	Potassium	6010C	Approved
WP & DMRQA Trace Elements	55024	1140	Selenium	6010C	Approved
WP Trace Elements	55025	1150	Silver	6010C	Approved
WP Trace Elements	55025	1160	Strontium	6010C	Approved
WP Trace Elements	55025	1165	Thallium	6010C	Approved
WP Trace Elements	55095	1175	Tin	6010C	Approved
WP Trace Elements	55025	1180	Titanium	6010C	Approved
WP & DMRQA Trace Elements	55024	1185	Vanadium	6010C	Approved
WP & DMRQA Trace Elements	55024	1190	Zinc	6010C	Approved
NPTA			Zirconium	6010C	Approved
WP & DMRQA Trace Elements	55024	1000	Aluminum	6020	Approved
WP Trace Elements	55025	1005	Antimony	6020	Approved
WP & DMRQA Trace Elements	55024	1010	Arsenic	6020	Approved
WP Trace Elements	55025	1015	Barium	6020	Approved
WP Trace Elements	55025	1020	Beryllium	6020	Approved
WP Trace Elements	55025	1025	Boron	6020	Approved
WP & DMRQA Trace Elements	55024	1030	Cadmium	6020	Approved
	55144	1035	Calcium	6020	Approved
WP & DMRQA Trace Elements	55024	1040	Chromium	6020	Approved
WP & DMRQA Trace Elements	55024	1050	Cobalt	6020	Approved
WP & DMRQA Trace Elements	55024	1055	Copper	6020	Approved
WP & DMRQA Trace Elements	55024	1070	Iron	6020	Approved
WP & DMRQA Trace Elements	55024	1075	Lead	6020	Approved
WP & DMRQA Trace Elements	55024	1090	Manganese	6020	Approved
WP Trace Elements	55025	1100	Molybdenum	6020	Approved
WP & DMRQA Trace Elements	55024	1105	Nickel	6020	Approved
NPTA			Total Phosphorous	6020	Approved
	55145	1125	Potassium	6020	Approved
WP & DMRQA Trace Elements	55024	1140	Selenium	6020	Approved
WP Trace Elements	55025	1150	Silver	6020	Approved
WP Trace Elements	55025	1160	Strontium	6020	Approved
WP Trace Elements	55025	1165	Thallium	6020	Approved
WP Tin	55095	1175	Tin	6020	Approved
WP Trace Elements	55025	1180	Titanium	6020	Approved
WP & DMRQA Trace Elements	55024	1185	Vanadium	6020	Approved
WP & DMRQA Trace Elements	55024	1190	Zinc	6020	Approved
NPTA			Zirconium	6020	Approved
WP & DMRQA Trace Elements	55024	1000	Aluminum	6020A	Approved
WP Trace Elements	55025	1005	Antimony	6020A	Approved
WP & DMRQA Trace Elements	55024	1010	Arsenic	6020A	Approved
WP Trace Elements	55025	1015	Barium	6020A	Approved
WP Trace Elements	55025	1020	Beryllium	6020A	Approved
WP Trace Elements	55025	1025	Boron	6020A	Approved
WP & DMRQA Trace Elements	55024	1030	Cadmium	6020A	Approved
	55144	1035	Calcium	6020A	Approved
WP & DMRQA Trace Elements	55024	1040	Chromium	6020A	Approved
WP & DMRQA Trace Elements	55024	1050	Cobalt	6020A	Approved
WP & DMRQA Trace Elements	55024	1055	Copper	6020A	Approved
WP & DMRQA Trace Elements	55024	1070	Iron	6020A	Approved
WP & DMRQA Trace Elements	55024	1075	Lead	6020A	Approved
WP & DMRQA Trace Elements	55024	1090	Manganese	6020A	Approved
WP Trace Elements	55025	1100	Molybdenum	6020A	Approved
WP & DMRQA Trace Elements	55024	1105	Nickel	6020A	Approved
NPTA			Total Phosphorous	6020A	Approved
	55145	1125	Potassium	6020A	Approved
WP & DMRQA Trace Elements	55024	1140	Selenium	6020A	Approved
WP Trace Elements	55025	1150	Silver	6020A	Approved
WP Trace Elements	55025	1160	Strontium	6020A	Approved
WP Trace Elements	55025	1165	Thallium	6020A	Approved
	55095	1175	Tin	6020A	Approved
WP Trace Elements	55025	1180	Titanium	6020A	Approved
WP & DMRQA Trace Elements	55024	1185	Vanadium	6020A	Approved

WP & DMRQA Trace Elements	55024	1190	Zinc	6020A	Approved
NPTA			Zirconium	6020A	Approved
WP Perchlorate	55116	1895	Perchlorate	6850	Approved
WP Hexavalent Chromium	55096	1045	Chromium VI	7196A	Approved
WP Hexavalent Chromium	55096	1045	Chromium VI	7199	Approved
WP & DMRQA Trace Elements	55024	1095	Mercury	7470A	Approved
Volatiles	PEO-120-3B	5180	1,2,3-Trichloropropane	8011	Approved
Volatiles	PEO-120-3B	4570	1,2-Dibromo-3-chloropropane (DBCP)	8011	Approved
Volatiles	PEO-120-3B	4585	1,2-Dibromomethane (EDB, Ethylene dibromide)	8011	Approved
Volatiles	PEO-010	9408	Gasoline Range Organics, C6-C10	8015B	Approved
			Motor Oil	8015B	Approved
Petroleum Hydrocarbons in Water	PEO-010	99990	Total Purgeable Hydrocarbons	8015B	Approved
Petroleum Hydrocarbons in Water	PEO-011	9369	Diesel Range Organics (C10-C28)	8015B	Approved
Volatiles	PEO-010	9408	Gasoline Range Organics, C6-C10	8015C	Approved
			Motor Oil	8015C	Approved
Petroleum Hydrocarbons in Water	PEO-010	99990	Total Purgeable Hydrocarbons	8015C	Approved
Petroleum Hydrocarbons in Water	PEO-011	9369	Diesel Range Organics (C10-C28)	8015C	Approved
Volatiles	PEO-010	9408	Gasoline Range Organics, C6-C10	8015D	Approved
			Motor Oil	8015D	Approved
Petroleum Hydrocarbons in Water	PEO-010	99990	Total Purgeable Hydrocarbons	8015D	Approved
Petroleum Hydrocarbons in Water	PEO-011	9369	Diesel Range Organics (C10-C28)	8015D	Approved
WP Pesticide Amp 2	38046	7250	Chlordane	8081A	Approved
WP Organochlorine Pesticides	38122	7810	4,4';-Methoxychlor	8081A	Approved
WP Organochlorine Pesticides	38122	7355	4,4'-DDD	8081A	Approved
WP Organochlorine Pesticides	38122	7360	4,4'-DDE	8081A	Approved
WP Organochlorine Pesticides	38122	7365	4,4'-DDT	8081A	Approved
WP Organochlorine Pesticides	38122	7110	a-BHC	8081A	Approved
WP Organochlorine Pesticides	38122	7240	a-Chlordane	8081A	Approved
WP Organochlorine Pesticides	38122	7025	Aldrin	8081A	Approved
WP Organochlorine Pesticides	38122	7115	b-BHC	8081A	Approved
WP Organochlorine Pesticides	38122	7105	d-BHC	8081A	Approved
WP Organochlorine Pesticides	38122	7470	Dieldrin	8081A	Approved
WP Organochlorine Pesticides	38122	7510	Endosulfan I	8081A	Approved
WP Organochlorine Pesticides	38122	7515	Endosulfan II	8081A	Approved
WP Organochlorine Pesticides	38122	7520	Endosulfan sulfate	8081A	Approved
WP Organochlorine Pesticides	38122	7540	Endrin	8081A	Approved
WP Organochlorine Pesticides	38122	7530	Endrin aldehyde	8081A	Approved
WP Organochlorine Pesticides	38122	7535	Endrin ketone	8081A	Approved
WP Organochlorine Pesticides	38122	7120	g-BHC (Lindane)	8081A	Approved
WP Organochlorine Pesticides	38122	7245	g-Chlordane	8081A	Approved
WP Organochlorine Pesticides	38122	7685	Heptachlor	8081A	Approved
WP Organochlorine Pesticides	38122	7690	Heptachlor epoxide	8081A	Approved
			Hexachlorobenzene	8081A	Approved
WP Toxaphene	38125	8250	Toxaphene	8081A	Approved
WP Pesticide Amp 2	38046	7250	Chlordane	8081B	Approved
WP Organochlorine Pesticides	38122	7810	4,4';-Methoxychlor	8081B	Approved
WP Organochlorine Pesticides	38122	7355	4,4'-DDD	8081B	Approved
WP Organochlorine Pesticides	38122	7360	4,4'-DDE	8081B	Approved
WP Organochlorine Pesticides	38122	7365	4,4'-DDT	8081B	Approved
WP Organochlorine Pesticides	38122	7110	a-BHC	8081B	Approved
WP Organochlorine Pesticides	38122	7240	a-Chlordane	8081B	Approved
WP Organochlorine Pesticides	38122	7025	Aldrin	8081B	Approved
WP Organochlorine Pesticides	38122	7115	b-BHC	8081B	Approved
WP Organochlorine Pesticides	38122	7105	d-BHC	8081B	Approved
WP Organochlorine Pesticides	38122	7470	Dieldrin	8081B	Approved
WP Organochlorine Pesticides	38122	7510	Endosulfan I	8081B	Approved
WP Organochlorine Pesticides	38122	7515	Endosulfan II	8081B	Approved
WP Organochlorine Pesticides	38122	7520	Endosulfan sulfate	8081B	Approved
WP Organochlorine Pesticides	38122	7540	Endrin	8081B	Approved
WP Organochlorine Pesticides	38122	7530	Endrin aldehyde	8081B	Approved
WP Organochlorine Pesticides	38122	7535	Endrin ketone	8081B	Approved
WP Organochlorine Pesticides	38122	7120	g-BHC (Lindane)	8081B	Approved
WP Organochlorine Pesticides	38122	7245	g-Chlordane	8081B	Approved
WP Organochlorine Pesticides	38122	7685	Heptachlor	8081B	Approved
WP Organochlorine Pesticides	38122	7690	Heptachlor epoxide	8081B	Approved
			Hexachlorobenzene	8081B	Approved
WP Toxaphene	38125	8250	Toxaphene	8081B	Approved
WP PCBs in Water #2	38091	8880	Aroclor 1016	8082	Approved
WP PCBs in Water #2	38091	8885	Aroclor 1221	8082	Approved
WP PCBs in Water #2	38091	8890	Aroclor 1232	8082	Approved
WP PCBs in Water #2	38091	8895	Aroclor 1242	8082	Approved
WP PCBs in Water #2	38091	8900	Aroclor 1248	8082	Approved
WP PCBs in Water #2	38091	8905	Aroclor 1254	8082	Approved
WP PCBs in Water #2	38091	8910	Aroclor 1260	8082	Approved
WP PCBs in Transformer Oil #2	38092	8880	PCB in Oil 1016 or 1242	8082	Approved
WP PCBs in Transformer Oil #2	38092	100	PCB in Oil 1254	8082	Approved
WP PCBs in Transformer Oil #2	38092	8910	PCB in Oil 1260	8082	Approved
WP PCBs in Water #1	38094	8880	Aroclor 1016	8082	Approved
WP PCBs in Water #1	38094	8885	Aroclor 1221	8082	Approved
WP PCBs in Water #1	38094	8890	Aroclor 1232	8082	Approved
WP PCBs in Water #1	38094	8895	Aroclor 1242	8082	Approved
WP PCBs in Water #1	38094	8900	Aroclor 1248	8082	Approved

WP PCBs in Water #1	38094	8905	Aroclor 1254	8082	Approved
WP PCBs in Water #1	38094	8910	Aroclor 1260	8082	Approved
WP PCBs in Water	38095	8880	PCB in Oil 1016 or 1242	8082	Approved
WP PCBs in Water	38095	100	PCB in Oil 1254	8082	Approved
WP PCBs in Water	38095	101	PCB in Oil 1260	8082	Approved
WS PCBs in Water	38133	8880	Aroclor 1016	8082	Approved
WS PCBs in Water	38133	8885	Aroclor 1221	8082	Approved
WS PCBs in Water	38133	8890	Aroclor 1232	8082	Approved
WS PCBs in Water	38133	8895	Aroclor 1242	8082	Approved
WS PCBs in Water	38133	8900	Aroclor 1248	8082	Approved
WS PCBs in Water	38133	8905	Aroclor 1254	8082	Approved
WS PCBs in Water	38133	8910	Aroclor 1260	8082	Approved
PCBs in Water	PEO-020	8912	Aroclor 1016/1242	8082	Approved
PCBs in Water	PEO-020	8912	Aroclor 1016/1242	8082	Approved
PCBs in Water	PEO-020	8880	Aroclor-1016 (PCB-1016)	8082	Approved
PCBs in Water	PEO-020	8880	Aroclor-1016 (PCB-1016)	8082	Approved
PCBs in Water	PEO-020	8885	Aroclor-1221 (PCB-1221)	8082	Approved
PCBs in Water	PEO-020	8885	Aroclor-1221 (PCB-1221)	8082	Approved
PCBs in Water	PEO-020	8890	Aroclor-1232 (PCB-1232)	8082	Approved
PCBs in Water	PEO-020	8890	Aroclor-1232 (PCB-1232)	8082	Approved
PCBs in Water	PEO-020	8895	Aroclor-1242 (PCB-1242)	8082	Approved
PCBs in Water	PEO-020	8895	Aroclor-1242 (PCB-1242)	8082	Approved
PCBs in Water	PEO-020	8900	Aroclor-1248 (PCB-1248)	8082	Approved
PCBs in Water	PEO-020	8900	Aroclor-1248 (PCB-1248)	8082	Approved
PCBs in Water	PEO-020	8905	Aroclor-1254 (PCB-1254)	8082	Approved
PCBs in Water	PEO-020	8905	Aroclor-1254 (PCB-1254)	8082	Approved
PCBs in Water	PEO-020	8910	Aroclor-1260 (PCB-1260)	8082	Approved
PCBs in Water	PEO-020	8910	Aroclor-1260 (PCB-1260)	8082	Approved
WP PCBs in Water #2	38091	8880	Aroclor 1016	8082A	Approved
WP PCBs in Water #2	38091	8885	Aroclor 1221	8082A	Approved
WP PCBs in Water #2	38091	8890	Aroclor 1232	8082A	Approved
WP PCBs in Water #2	38091	8895	Aroclor 1242	8082A	Approved
WP PCBs in Water #2	38091	8900	Aroclor 1248	8082A	Approved
WP PCBs in Water #2	38091	8905	Aroclor 1254	8082A	Approved
WP PCBs in Water #2	38091	8910	Aroclor 1260	8082A	Approved
WP PCBs in Transformer Oil #2	38092	8880	PCB in Oil 1016 or 1242	8082A	Approved
WP PCBs in Transformer Oil #2	38092	100	PCB in Oil 1254	8082A	Approved
WP PCBs in Transformer Oil #2	38092	8910	PCB in Oil 1260	8082A	Approved
WP PCBs in Water #1	38094	8880	Aroclor 1016	8082A	Approved
WP PCBs in Water #1	38094	8885	Aroclor 1221	8082A	Approved
WP PCBs in Water #1	38094	8890	Aroclor 1232	8082A	Approved
WP PCBs in Water #1	38094	8895	Aroclor 1242	8082A	Approved
WP PCBs in Water #1	38094	8900	Aroclor 1248	8082A	Approved
WP PCBs in Water #1	38094	8905	Aroclor 1254	8082A	Approved
WP PCBs in Water #1	38094	8910	Aroclor 1260	8082A	Approved
WP PCBs in Water	38095	8880	PCB in Oil 1016 or 1242	8082A	Approved
WP PCBs in Water	38095	100	PCB in Oil 1254	8082A	Approved
WP PCBs in Water	38095	101	PCB in Oil 1260	8082A	Approved
WS PCBs in Water	38133	8880	Aroclor 1016	8082A	Approved
WS PCBs in Water	38133	8885	Aroclor 1221	8082A	Approved
WS PCBs in Water	38133	8890	Aroclor 1232	8082A	Approved
WS PCBs in Water	38133	8895	Aroclor 1242	8082A	Approved
WS PCBs in Water	38133	8900	Aroclor 1248	8082A	Approved
WS PCBs in Water	38133	8905	Aroclor 1254	8082A	Approved
WS PCBs in Water	38133	8910	Aroclor 1260	8082A	Approved
PCBs in Water	PEO-020	8912	Aroclor 1016/1242	8082A	Approved
PCBs in Water	PEO-020	8912	Aroclor 1016/1242	8082A	Approved
PCBs in Water	PEO-020	8880	Aroclor-1016 (PCB-1016)	8082A	Approved
PCBs in Water	PEO-020	8880	Aroclor-1016 (PCB-1016)	8082A	Approved
PCBs in Water	PEO-020	8885	Aroclor-1221 (PCB-1221)	8082A	Approved
PCBs in Water	PEO-020	8885	Aroclor-1221 (PCB-1221)	8082A	Approved
PCBs in Water	PEO-020	8890	Aroclor-1232 (PCB-1232)	8082A	Approved
PCBs in Water	PEO-020	8890	Aroclor-1232 (PCB-1232)	8082A	Approved
PCBs in Water	PEO-020	8895	Aroclor-1242 (PCB-1242)	8082A	Approved
PCBs in Water	PEO-020	8895	Aroclor-1242 (PCB-1242)	8082A	Approved
PCBs in Water	PEO-020	8900	Aroclor-1248 (PCB-1248)	8082A	Approved
PCBs in Water	PEO-020	8900	Aroclor-1248 (PCB-1248)	8082A	Approved
PCBs in Water	PEO-020	8905	Aroclor-1254 (PCB-1254)	8082A	Approved
PCBs in Water	PEO-020	8905	Aroclor-1254 (PCB-1254)	8082A	Approved
PCBs in Water	PEO-020	8910	Aroclor-1260 (PCB-1260)	8082A	Approved
PCBs in Water	PEO-020	8910	Aroclor-1260 (PCB-1260)	8082A	Approved
CWA Organophosphorous Pesticides	38135	7075	Azinphosmethyl	8141A	Approved
WP Organophosphorous Pesticides	38135	7075	Azinphosmethyl (Guthion)	8141A	Approved
CWA Organophosphorous Pesticides	38135	7300	Chlorpyrifos	8141A	Approved
WP Organophosphorous Pesticides	38135	7390	Demeton, (Mix of Isomers O:S [35%:56%])	8141A	Approved
CWA Organophosphorous Pesticides	38135	7390	Demeton, (Mix of Isomers O:S)	8141A	Approved
CWA Organophosphorous Pesticides	38135	7410	Diazinon	8141A	Approved
WP Organophosphorous Pesticides	38135	7410	Diazinon	8141A	Approved
CWA Organophosphorous Pesticides	38135	8610	Dichlorvos	8141A	Approved
CWA Organophosphorous Pesticides	38135	7475	Dimethoate	8141A	Approved
CWA Organophosphorous Pesticides	38135	8625	Disulfoton	8141A	Approved
WP Organophosphorous Pesticides	38135	8625	Disulfoton	8141A	Approved

CWA Organophosphorous Pesticides	38135	7565	Ethion	8141A	Approved
WP Organophosphorous Pesticides	38135	7565	Ethion	8141A	Approved
CWA Organophosphorous Pesticides	38135	7570	Ethoprop	8141A	Approved
CWA Organophosphorous Pesticides	38135	7770	Malathion	8141A	Approved
WP Organophosphorous Pesticides	38135	7770	Malathion	8141A	Approved
CWA Organophosphorous Pesticides	38135	7955	Parathion ethyl	8141A	Approved
CWA Organophosphorous Pesticides	38135	7825	Parathion methyl	8141A	Approved
CWA Organophosphorous Pesticides	38135	7985	Phorate	8141A	Approved
CWA Organophosphorous Pesticides	38135	8110	Ronnel	8141A	Approved
CWA Organophosphorous Pesticides	38135	8200	Stirophos	8141A	Approved
CWA Organophosphorous Pesticides	38135	7075	Azinphosmethyl	8141B	Approved
WP Organophosphorous Pesticides	38135	7075	Azinphosmethyl (Guthion)	8141B	Approved
CWA Organophosphorous Pesticides	38135	7300	Chlorpyrifos	8141B	Approved
WP Organophosphorous Pesticides	38135	7390	Demeton, (Mix of Isomers O:S [35%:56%])	8141B	Approved
CWA Organophosphorous Pesticides	38135	7390	Demeton, (Mix of Isomers O:S)	8141B	Approved
CWA Organophosphorous Pesticides	38135	7410	Diazinon	8141B	Approved
WP Organophosphorous Pesticides	38135	7410	Diazinon	8141B	Approved
CWA Organophosphorous Pesticides	38135	8610	Dichlorvos	8141B	Approved
CWA Organophosphorous Pesticides	38135	7475	Dimethoate	8141B	Approved
CWA Organophosphorous Pesticides	38135	8625	Disulfoton	8141B	Approved
WP Organophosphorous Pesticides	38135	8625	Disulfoton	8141B	Approved
CWA Organophosphorous Pesticides	38135	7565	Ethion	8141B	Approved
WP Organophosphorous Pesticides	38135	7565	Ethion	8141B	Approved
CWA Organophosphorous Pesticides	38135	7570	Ethoprop	8141B	Approved
CWA Organophosphorous Pesticides	38135	7770	Malathion	8141B	Approved
WP Organophosphorous Pesticides	38135	7770	Malathion	8141B	Approved
CWA Organophosphorous Pesticides	38135	7955	Parathion ethyl	8141B	Approved
CWA Organophosphorous Pesticides	38135	7825	Parathion methyl	8141B	Approved
CWA Organophosphorous Pesticides	38135	7985	Phorate	8141B	Approved
CWA Organophosphorous Pesticides	38135	8110	Ronnel	8141B	Approved
CWA Organophosphorous Pesticides	38135	8200	Stirophos	8141B	Approved
WP Herbicide Acid Mix #2	38136	8655	2,4,5-T	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8545	2,4-D (2,4-Dichlorophenoxyacetic acid)	8151A	Approved
WP Herbicide Acid Mix #2	38136	8560	2,4-DB	8151A	Approved
WP Herbicide Acid Mix #2	38136	8600	3,5-Dichlorobenzoic acid	8151A	Approved
WP Herbicide Acid Mix #2	38136	6500	4-Nitrophenol	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8505	Acifluorfen	8151A	Approved
WP Herbicide Acid Mix #2	38136	8530	Bentazon	8151A	Approved
WP Herbicide Acid Mix #2	38136	8540	Chloramben	8151A	Approved
WP Herbicide Acid Mix #2	38136	8550	Dacthal	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8555	Dalapon	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8595	Dicamba	8151A	Approved
WP Herbicide Acid Mix #2	38136	8605	Dichlorprop	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8620	Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8151A	Approved
NPTA			MCPA	8151A	Approved
NPTA			MCPP	8151A	Approved
WP Acrolein & Acrylonitrile	38126	6605	Pentachlorophenol	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8645	Picloram	8151A	Approved
WP Acrolein & Acrylonitrile	38126	8650	Silvex (2,4,5-TP)	8151A	Approved
Volatiles in Non-Portable Water	38083	5105	1,1,1,2-Tetrachloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	5160	1,1,1-Trichloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	5110	1,1,2,2-Tetrachloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	5165	1,1,2-Trichloroethane	8260B	Approved
WP Oxygenates	38157	5185	1,1,2-Trichlorotrifluoroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4630	1,1-Dichloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4640	1,1-Dichloroethene	8260B	Approved
Volatiles in Non-Portable Water	38083	4670	1,1-Dichloropropene	8260B	Approved
Volatiles in Non-Portable Water	38083	5150	1,2,3-Trichlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	5180	1,2,3-Trichloropropane	8260B	Approved
Volatiles in Non-Portable Water	38083	5155	1,2,4-Trichlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	5210	1,2,4-Trimethylbenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4570	1,2-Dibromo-3-chloropropane	8260B	Approved
Volatiles in Non-Portable Water	38083	4585	1,2-Dibromoethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4610	1,2-Dichlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4635	1,2-Dichloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4655	1,2-Dichloropropane	8260B	Approved
Volatiles in Non-Portable Water	38083	5215	1,3,5-Trimethylbenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4615	1,3-Dichlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4660	1,3-Dichloropropane	8260B	Approved
Volatiles in Non-Portable Water	38083	4620	1,4-Dichlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4665	2,2-Dichloropropane	8260B	Approved
WP Ketones	38134	4410	2-Butanone	8260B	Approved
WP Ketones	38134	4410	2-Butanone	8260B	Approved
WP 2-Chloroethyl vinyl ether	38128	4500	2-Chloroethyl vinyl ether	8260B	Approved
Volatiles in Non-Portable Water	38083	4535	2-Chlorotoluene	8260B	Approved
WP Ketones	38134	4860	2-Hexanone	8260B	Approved
WP Ketones	38134	4860	2-Hexanone	8260B	Approved
Volatiles in Non-Portable Water	38083	4540	4-Chlorotoluene	8260B	Approved
Volatiles in Non-Portable Water	38083	4995	4-methyl-2-pentanone	8260B	Approved
WP Ketones	38134	4995	4-Methyl-2-pentanone	8260B	Approved
WP Ketones	38134	4995	4-Methyl-2-pentanone	8260B	Approved
WP Ketones	38134	4315	Acetone	8260B	Approved

WP Ketones	38134	4315	Acetone	8260B	Approved
WP Acrolein & Acrylonitrile	38123	0150	Acrolein	8260B	Approved
WP Acrolein & Acrylonitrile	38123	4325	Acrolein	8260B	Approved
WP Acrolein & Acrylonitrile	38123	1051	Acrolein	8260B	Approved
WP Acrolein & Acrylonitrile	38123	1051	Acrylonitrile	8260B	Approved
Volatiles in Non-Portable Water	38083	4375	Benzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4385	Bromobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4390	Bromochloromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4395	Bromodichloromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4400	Bromoform	8260B	Approved
Volatiles in Non-Portable Water	38083	4950	Bromomethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4450	Carbon disulphide	8260B	Approved
Volatiles in Non-Portable Water	38083	4455	Carbon tetrachloride	8260B	Approved
Volatiles in Non-Portable Water	38083	4475	Chlorobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4485	Chloroethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4505	Chloroform	8260B	Approved
Volatiles in Non-Portable Water	38083	4960	Chloromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4645	cis-1,2-Dichloroethene	8260B	Approved
Volatiles in Non-Portable Water	38083	4680	cis-1,3-Dichloropropene	8260B	Approved
Volatiles in Non-Portable Water	38083	4575	Dibromochloromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4595	Dibromomethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4625	Dichlorodifluoromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	4765	Ethyl benzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4835	Hexachlorobutadiene	8260B	Approved
Volatiles in Non-Portable Water	38083	4840	Hexachloroethane	8260B	Approved
WP Oxygenates	38157	9375	Isopropyl ether (DIPE)	8260B	Approved
Volatiles in Non-Portable Water	38083	4900	Isopropylbenzene	8260B	Approved
NPTA			Methyl Ethyl Ketone	8260B	Approved
Volatiles in Non-Portable Water	38083	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
WP Oxygenates	38157	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
Volatiles in Non-Portable Water	38083	4975	Methylene chloride (Dichloromethane)	8260B	Approved
Volatiles in Non-Portable Water	38083	5005	Naphthalene	8260B	Approved
Volatiles in Non-Portable Water	38083	4435	n-Butyl benzene	8260B	Approved
Volatiles in Non-Portable Water	38083	5015	Nitrobenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	5090	n-Propylbenzene	8260B	Approved
WP Oxygenates	38157	5090	n-Propylbenzene	8260B	Approved
Volatiles in Non-Portable Water	38083	4440	sec-Butyl benzene	8260B	Approved
Volatiles in Non-Portable Water	38083	5100	Styrene	8260B	Approved
WP Oxygenates	38157	4370	tert-Amyl methyl ether (TAME)	8260B	Approved
WP Oxygenates	38157	4420	tert-Butyl alcohol (t-Butanol)	8260B	Approved
Volatiles in Non-Portable Water	38083	4445	tert-Butyl benzene	8260B	Approved
WP Oxygenates	38157	4770	tert-Butyl ethyl ether (ETBE)	8260B	Approved
Volatiles in Non-Portable Water	38083	5115	Tetrachloroethene	8260B	Approved
Volatiles in Non-Portable Water	38083	5140	Toluene	8260B	Approved
Volatiles in Non-Portable Water	38083	5260	Total Xylenes	8260B	Approved
Volatiles in Non-Portable Water	38083	4700	trans-1,2-Dichloroethene	8260B	Approved
Volatiles in Non-Portable Water	38083	4685	trans-1,3-Dichloropropene	8260B	Approved
Volatiles in Non-Portable Water	38083	5170	Trichloroethene	8260B	Approved
Volatiles in Non-Portable Water	38083	5175	Trichlorofluoromethane	8260B	Approved
Volatiles in Non-Portable Water	38083	5235	Vinyl chloride	8260B	Approved
NPTA			Cyclohexane	8260B	Approved
NPTA			Methyl Acetate	8260B	Approved
NPTA			Methylcyclohexane	8260B	Approved
NPTA			m&p Xylenes	8260B	Approved
NPTA			o-Xylene	8260B	Approved
NPTA			p-isopropyltoluene	8260B	Approved
NPTA			Vinyl Acetate	8260B	Approved
Volatiles in Non-Portable Water	38083	5105	1,1,1,2-Tetrachloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	5160	1,1,1-Trichloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	5110	1,1,2,2-Tetrachloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	5165	1,1,2-Trichloroethane	8260C	Approved
WP Oxygenates	38157	5185	1,1,2-Trichlorotrifluoroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4630	1,1-Dichloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4640	1,1-Dichloroethene	8260C	Approved
Volatiles in Non-Portable Water	38083	4670	1,1-Dichloropropene	8260C	Approved
Volatiles in Non-Portable Water	38083	5150	1,2,3-Trichlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	5180	1,2,3-Trichloropropane	8260C	Approved
Volatiles in Non-Portable Water	38083	5155	1,2,4-Trichlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	5210	1,2,4-Trimethylbenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4570	1,2-Dibromo-3-chloropropane	8260C	Approved
Volatiles in Non-Portable Water	38083	4585	1,2-Dibromoethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4610	1,2-Dichlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4635	1,2-Dichloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4655	1,2-Dichloropropane	8260C	Approved
Volatiles in Non-Portable Water	38083	5215	1,3,5-Trimethylbenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4615	1,3-Dichlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4660	1,3-Dichloropropane	8260C	Approved
Volatiles in Non-Portable Water	38083	4620	1,4-Dichlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4665	2,2-Dichloropropane	8260C	Approved
WP Ketones	38134	4410	2-Butanone	8260C	Approved
WP 2-Chloroethyl vinyl ether	38128	4500	2-Chloroethyl vinyl ether	8260C	Approved
Volatiles in Non-Portable Water	38083	4535	2-Chlorotoluene	8260C	Approved

WP Ketones	38134	4860	2-Hexanone	8260C	Approved
Volatiles in Non-Portable Water	38083	4540	4-Chlorotoluene	8260C	Approved
Volatiles in Non-Portable Water	38083	4995	4-methyl-2-pentanone	8260C	Approved
WP Ketones	38134	4995	4-Methyl-2-pentanone	8260C	Approved
WP Ketones	38134	4315	Acetone	8260C	Approved
WP Acrolein & Acrylonitrile	38123	4325	Acrolein (Propenal)	8260C	Approved
WP Acrolein & Acrylonitrile	38123	1051	Acrylonitrile	8260C	Approved
Volatiles in Non-Portable Water	38083	4375	Benzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4385	Bromobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4390	Bromochloromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4395	Bromodichloromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4400	Bromoform	8260C	Approved
Volatiles in Non-Portable Water	38083	4950	Bromomethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4450	Carbon disulphide	8260C	Approved
Volatiles in Non-Portable Water	38083	4455	Carbon tetrachloride	8260C	Approved
Volatiles in Non-Portable Water	38083	4475	Chlorobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4485	Chloroethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4505	Chloroform	8260C	Approved
Volatiles in Non-Portable Water	38083	4960	Chloromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4645	cis-1,2-Dichloroethene	8260C	Approved
Volatiles in Non-Portable Water	38083	4680	cis-1,3-Dichloropropene	8260C	Approved
Volatiles in Non-Portable Water	38083	4575	Dibromochloromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4595	Dibromomethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4625	Dichlorodifluoromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	4765	Ethyl benzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4835	Hexachlorobutadiene	8260C	Approved
Volatiles in Non-Portable Water	38083	4840	Hexachloroethane	8260C	Approved
WP Oxygenates	38157	9375	Isopropyl ether (DIPE)	8260C	Approved
Volatiles in Non-Portable Water	38083	4900	Isopropylbenzene	8260C	Approved
NPTA			Methyl Ethyl Ketone	8260C	Approved
Volatiles in Non-Portable Water	38083	5000	Methyl tert-butyl ether (MTBE)	8260C	Approved
WP Oxygenates	38157	5000	Methyl tert-butyl ether (MTBE)	8260C	Approved
Volatiles in Non-Portable Water	38083	4975	Methylene chloride (Dichloromethane)	8260C	Approved
Volatiles in Non-Portable Water	38083	5005	Naphthalene	8260C	Approved
Volatiles in Non-Portable Water	38083	4435	n-Butyl benzene	8260C	Approved
Volatiles in Non-Portable Water	38083	5015	Nitrobenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	5090	n-Propylbenzene	8260C	Approved
WP Oxygenates	38157	5090	n-Propylbenzene	8260C	Approved
Volatiles in Non-Portable Water	38083	4910	p-isopropyl tolutne	8260C	Approved
Volatiles in Non-Portable Water	38083	4440	sec-Butyl benzene	8260C	Approved
Volatiles in Non-Portable Water	38083	5100	Styrene	8260C	Approved
WP Oxygenates	38157	4370	tert-Amyl methyl ether (TAME)	8260C	Approved
WP Oxygenates	38157	4420	tert-Butyl alcohol (t-Butanol)	8260C	Approved
Volatiles in Non-Portable Water	38083	4445	tert-Butyl benzene	8260C	Approved
WP Oxygenates	38157	4770	tert-Butyl ethyl ether (ETBE)	8260C	Approved
Volatiles in Non-Portable Water	38083	5115	Tetrachloroethene	8260C	Approved
Volatiles in Non-Portable Water	38083	5140	Toluene	8260C	Approved
Volatiles in Non-Portable Water	38083	5260	Total Xylenes	8260C	Approved
Volatiles in Non-Portable Water	38083	4700	trans-1,2-Dichloroethene	8260C	Approved
Volatiles in Non-Portable Water	38083	4685	trans-1,3-Dichloropropene	8260C	Approved
Volatiles in Non-Portable Water	38083	5170	Trichloroethene	8260C	Approved
Volatiles in Non-Portable Water	38083	5175	Trichlorofluoromethane	8260C	Approved
Volatiles in Non-Portable Water	38083	5235	Vinyl chloride	8260C	Approved
NPTA			Cyclohexane	8260C	Approved
NPTA			Methyl Acetate	8260C	Approved
NPTA			Methylcyclohexane	8260C	Approved
NPTA			m&p Xylenes	8260C	Approved
NPTA			o-Xylene	8260C	Approved
NPTA			p-isopropyltoluene	8260C	Approved
NPTA			Vinyl Acetate	8260C	Approved
Base/Neutrals	PEO-121-2A	5155	1,2,4-Trichlorbenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	5155	1,2,4-Trichlorobenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	4610	1,2-Dichlorobenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	4615	1,3-Dichlorobenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	4620	1,4-Dichlorobenzene	8270C	Approved
Acid Compounds	PEO-022	6735	2,3,4,6-Tetrachlorophenol	8270C	Approved
Acid Compounds	PEO-022	6835	2,4,5-Trichlorophenol	8270C	Approved
Acid Compounds	PEO-022	6840	2,4,6-Trichlorphenol	8270C	Approved
Acid Compounds	PEO-022	6000	2,4-Dichlorophenol	8270C	Approved
Acid Compounds	PEO-022	6130	2,4-Dimethylphenol	8270C	Approved
Acid Compounds	PEO-022	6175	2,4-Dinitrophenol	8270C	Approved
Base/Neutrals	PEO-121-2A	6185	2,4-Dinitrotoluene (2,4-DNT)	8270C	Approved
Acid Compounds	PEO-022	6005	2,6-Dichlorophenol	8270C	Approved
Base/Neutrals	PEO-121-2A	6190	2,6-Dinitrotoluene (2,6-DNT)	8270C	Approved
Base/Neutrals	PEO-121-2A	5795	2-Chloronaphthalene	8270C	Approved
Acid Compounds	PEO-022	5800	2-Chlorophenol	8270C	Approved
Acid Compounds	PEO-022	6360	2-Methyl-4,6-Dinitrophenol	8270C	Approved
Base/Neutrals	PEO-121-2A	6385	2-Methylnaphthalene	8270C	Approved
Acid Compounds	PEO-022	6400	2-Methylphenol	8270C	Approved
Base/Neutrals	PEO-121-2B	6460	2-Nitroaniline	8270C	Approved
Acid Compounds	PEO-022	6490	2-Nitrophenol	8270C	Approved
Base/Neutrals	PEO-121-2A	5945	3,3'-Dichlorobenzidine	8270C	Approved

Base/Neutrals	PEO-121-2B	6465	3-Nitroaniline	8270C	Approved
Acid Compounds	PEO-022	6410	3 & 4-Methylphenol	8270C	Approved
Base/Neutrals	PEO-121-2A	5660	4-Bromophenyl phenyl ether	8270C	Approved
Acid Compounds	PEO-022	5700	4-Chloro-3-methylphenol	8270C	Approved
Base/Neutrals	PEO-121-2B	5745	4-Chloroaniline	8270C	Approved
Base/Neutrals	PEO-121-2A	5825	4-Chlorophenyl-phenylether	8270C	Approved
Base/Neutrals	PEO-121-2B	6470	4-Nitroaniline	8270C	Approved
Acid Compounds	PEO-022	6500	4-Nitrophenol	8270C	Approved
Base/Neutrals	PEO-121-1	5500	Acenaphthene	8270C	Approved
Base/Neutrals	PEO-121-1	5505	Acenaphthylene	8270C	Approved
Base/Neutrals	PEO-121-2B	5545	Aniline	8270C	Approved
Base/Neutrals	PEO-121-1	5555	Anthracene	8270C	Approved
Base/Neutrals	PEO-121-2A	5595	Benzidine	8270C	Approved
Base/Neutrals	PEO-121-1	5575	Benzo(a)anthracene	8270C	Approved
Base/Neutrals	PEO-121-1	5580	Benzo(a)pyrene	8270C	Approved
Base/Neutrals	PEO-121-1	5585	Benzo(b)fluoranthene	8270C	Approved
Base/Neutrals	PEO-121-1	5601	Benzo(b+k)fluoranthene	8270C	Approved
Base/Neutrals	PEO-121-1	5590	Benzo(g,h,i)perylene	8270C	Approved
Base/Neutrals	PEO-121-1	5600	Benzo(k)fluoranthene	8270C	Approved
Acid Compounds	PEO-022	5610	Benzoic acid	8270C	Approved
Base/Neutrals	PEO-121-2B	5630	Benzyl alcohol	8270C	Approved
Base/Neutrals	PEO-121-2A	5670	Benzyl butyl phthalate	8270C	Approved
Base/Neutrals	PEO-121-2A	5760	bis(2-Chloroethoxy) methane	8270C	Approved
Base/Neutrals	PEO-121-2A	5765	bis(2-Chloroethyl) ether	8270C	Approved
Base/Neutrals	PEO-121-2A	5780	bis(2-Chloroisopropyl) ether	8270C	Approved
Base/Neutrals	PEO-121-2A	6255	bis(2-Ethylhexyl) phthalate	8270C	Approved
Base/Neutrals	PEO-121-2B	7180	Caprolactam	8270C	Approved
Base/Neutrals	PEO-121-2B	5680	Carbazole	8270C	Approved
Base/Neutrals	PEO-121-1	5855	Chrysene	8270C	Approved
Base/Neutrals	PEO-121-1	5895	Dibenz(a,h) anthracene	8270C	Approved
Base/Neutrals	PEO-121-2A	5905	Dibenzofuran	8270C	Approved
Base/Neutrals	PEO-121-2A	6070	Diethyl phthalate	8270C	Approved
Base/Neutrals	PEO-121-2A	6135	Dimethyl phthalate	8270C	Approved
Base/Neutrals	PEO-121-2A	5925	Di-n-butylphthalate	8270C	Approved
Base/Neutrals	PEO-121-2A	6200	Di-n-octylphthalate	8270C	Approved
Base/Neutrals	PEO-121-1	6265	Fluoranthene	8270C	Approved
Base/Neutrals	PEO-121-1	6270	Fluorene	8270C	Approved
Base/Neutrals	PEO-121-2A	6275	Hexachlorobenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	4835	Hexachlorobutadiene	8270C	Approved
Base/Neutrals	PEO-121-2A	6285	Hexachlorocyclopentadiene	8270C	Approved
Base/Neutrals	PEO-121-2A	4840	Hexachloroehane	8270C	Approved
Base/Neutrals	PEO-121-1	6315	Indeno(1,2,3-cd) pyrene	8270C	Approved
Base/Neutrals	PEO-121-2A	6320	Isophorone	8270C	Approved
Base/Neutrals	PEO-121-1	5005	Naphthalene	8270C	Approved
Base/Neutrals	PEO-121-2A	5015	Nitrobenzene	8270C	Approved
Base/Neutrals	PEO-121-2A	6530	N-nitrosodimethylamine	8270C	Approved
Base/Neutrals	PEO-121-2A	6545	N-nitrosodi-n-propylamine	8270C	Approved
Base/Neutrals	PEO-121-2A	6535	N-nitrosodiphenylamine	8270C	Approved
Acid Compounds	PEO-022	6605	Pentachlorophenol	8270C	Approved
Base/Neutrals	PEO-121-1	6615	Phenanthrene	8270C	Approved
Acid Compounds	PEO-022	6625	Phenol	8270C	Approved
Base/Neutrals	PEO-121-1	6665	Pyrene	8270C	Approved
Base/Neutrals	PEO-121-2B	5095	Pyridine	8270C	Approved
Low Level PAHs	PEO-259	5500	Acenaphthene	8270C SIM	Approved
Low Level PAHs	PEO-259	5505	Acenaphthylene	8270C SIM	Approved
Low Level PAHs	PEO-259	5555	Anthracene	8270C SIM	Approved
Low Level PAHs	PEO-259	5575	Benzo(a)anthracene	8270C SIM	Approved
Low Level PAHs	PEO-259	5580	Benzo(a)pyrene	8270C SIM	Approved
Low Level PAHs	PEO-259	5585	Benzo(b)fluoranthene	8270C SIM	Approved
Low Level PAHs	PEO-259	5590	Benzo(g,h,I)perylene	8270C SIM	Approved
Low Level PAHs	PEO-259	5600	Benzo(k)fluoranthene	8270C SIM	Approved
Low Level PAHs	PEO-259	5855	Chrysene	8270C SIM	Approved
Low Level PAHs	PEO-259	5895	Dibenzo(a,h)anthracene	8270C SIM	Approved
Low Level PAHs	PEO-259	6265	Fluoranthene	8270C SIM	Approved
Low Level PAHs	PEO-259	6270	Fluorene	8270C SIM	Approved
Low Level PAHs	PEO-259	6315	Indeno(1,2,3-cd) pyrene	8270C SIM	Approved
Low Level PAHs	PEO-259	5005	Naphthalene	8270C SIM	Approved
Low Level PAHs	PEO-259	6615	Penanthrene	8270C SIM	Approved
Low Level PAHs	PEO-259	6665	Pyrene	8270C SIM	Approved
Low Level PAHs			2-Methylnaphthalene	8270C SIM	Approved
Base/Neutrals	PEO-121-2A	5155	1,2,4-Trichlorbenzene	8270D	Approved
Base/Neutrals	PEO-121-2A	4610	1,2-Dichlorobenzene	8270D	Approved
Base/Neutrals	PEO-121-2A	4615	1,3-Dichlorobenzene	8270D	Approved
Base/Neutrals	PEO-121-2A	4620	1,4-Dichlorobenzene	8270D	Approved
Acid Compounds	PEO-022	6735	2,3,4,6-Tetrachlorophenol	8270D	Approved
Acid Compounds	PEO-022	6835	2,4,5-Trichlorophenol	8270D	Approved
Acid Compounds	PEO-022	6840	2,4,6-Trichlorphenol	8270D	Approved
Acid Compounds	PEO-022	6000	2,4-Dichlorophenol	8270D	Approved
Acid Compounds	PEO-022	6130	2,4-Dimethylphenol	8270D	Approved
Acid Compounds	PEO-022	6175	2,4-Dinitrophenol	8270D	Approved
Base/Neutrals	PEO-121-2A	6185	2,4-Dinitrotoluene (2,4-DNT)	8270D	Approved
Acid Compounds	PEO-022	6005	2,6-Dichlorophenol	8270D	Approved

Base/Neutrals	PEO-121-2A	6190	2,6-Dinitrotoluene (2,6-DNT)	8270D	Approved
Base/Neutrals	PEO-121-2A	5795	2-Chloronaphthalene	8270D	Approved
Acid Compounds	PEO-022	5800	2-Chlorophenol	8270D	Approved
Acid Compounds	PEO-022	6360	2-Methyl-4,6-Dinitrophenol	8270D	Approved
Base/Neutrals	PEO-121-2A	6385	2-Methylnaphthalene	8270D	Approved
Acid Compounds	PEO-022	6400	2-Methylphenol	8270D	Approved
Base/Neutrals	PEO-121-2B	6460	2-Nitroaniline	8270D	Approved
Acid Compounds	PEO-022	6490	2-Nitrophenol	8270D	Approved
Base/Neutrals	PEO-121-2A	5945	3,3'-Dichlorobenzidine	8270D	Approved
Base/Neutrals	PEO-121-2B	6465	3-Nitroaniline	8270D	Approved
Acid Compounds	PEO-022	6410	4 & 4-Methylphenol	8270D	Approved
Base/Neutrals	PEO-121-2A	5660	4-Bromophenyl phenyl ether	8270D	Approved
Acid Compounds	PEO-022	5700	4-Chloro-3-methylphenol	8270D	Approved
Base/Neutrals	PEO-121-2B	5745	4-Chloroaniline	8270D	Approved
Base/Neutrals	PEO-121-2A	5825	4-Chlorophenyl-phenylether	8270D	Approved
Base/Neutrals	PEO-121-2B	6470	4-Nitroaniline	8270D	Approved
Acid Compounds	PEO-022	6500	4-Nitrophenol	8270D	Approved
Base/Neutrals	PEO-121-2B	5545	Aniline	8270D	Approved
Base/Neutrals	PEO-121-2A	5595	Benzidine	8270D	Approved
Acid Compounds	PEO-022	5610	Benzoic acid	8270D	Approved
Base/Neutrals	PEO-121-2B	5630	Benzyl alcohol	8270D	Approved
Base/Neutrals	PEO-121-2A	5670	Benzyl butyl phthalate	8270D	Approved
Base/Neutrals	PEO-121-2A	5760	bis(2-Chloroethoxy) methane	8270D	Approved
Base/Neutrals	PEO-121-2A	5765	bis(2-Chloroethyl) ether	8270D	Approved
Base/Neutrals	PEO-121-2A	5780	bis(2-Chloroisopropyl) ether	8270D	Approved
Base/Neutrals	PEO-121-2A	6255	bis(2-Ethylhexyl) phthalate	8270D	Approved
Base/Neutrals	PEO-121-2B	7180	Caprolactam	8270D	Approved
Base/Neutrals	PEO-121-2B	5680	Carbazole	8270D	Approved
Base/Neutrals	PEO-121-2A	5905	Dibenzofuran	8270D	Approved
Base/Neutrals	PEO-121-2A	6070	Diethyl phthalate	8270D	Approved
Base/Neutrals	PEO-121-2A	6135	Dimethyl phthalate	8270D	Approved
Base/Neutrals	PEO-121-2A	5925	Di-n-butylphthalate	8270D	Approved
Base/Neutrals	PEO-121-2A	6200	Di-n-octylphthalate	8270D	Approved
Base/Neutrals	PEO-121-2A	6275	Hexachlorobenzene	8270D	Approved
Base/Neutrals	PEO-121-2A	4835	Hexachlorobutadiene	8270D	Approved
Base/Neutrals	PEO-121-2A	6285	Hexachlorocyclopentadiene	8270D	Approved
Base/Neutrals	PEO-121-2A	4840	Hexachloroehane	8270D	Approved
Base/Neutrals	PEO-121-2A	6320	Isophorone	8270D	Approved
Base/Neutrals	PEO-121-2A	5015	Nitrobenzene	8270D	Approved
Base/Neutrals	PEO-121-2A	6530	N-nitrosodimethylamine	8270D	Approved
Base/Neutrals	PEO-121-2A	6545	N-nitrosodi-n-propylamine	8270D	Approved
Base/Neutrals	PEO-121-2A	6535	N-nitrosodiphenylamine	8270D	Approved
Acid Compounds	PEO-022	6605	Pentachlorophenol	8270D	Approved
Acid Compounds	PEO-022	6625	Phenol	8270D	Approved
Base/Neutrals	PEO-121-2B	5095	Pyridine	8270D	Approved
Low Level PAHs	PEO-259	5500	Acenaphthene	8270D SIM	Approved
Low Level PAHs	PEO-259	5505	Acenaphthylene	8270D SIM	Approved
Low Level PAHs	PEO-259	5555	Anthracene	8270D SIM	Approved
Low Level PAHs	PEO-259	5575	Benzo(a)anthracene	8270D SIM	Approved
Low Level PAHs	PEO-259	5580	Benzo(a)pyrene	8270D SIM	Approved
Low Level PAHs	PEO-259	5585	Benzo(b)fluoranthene	8270D SIM	Approved
Low Level PAHs	PEO-259	5590	Benzo(g,h,I)perylene	8270D SIM	Approved
Low Level PAHs	PEO-259	5600	Benzo(k)fluoranthene	8270D SIM	Approved
Low Level PAHs	PEO-259	5855	Chrysene	8270D SIM	Approved
Low Level PAHs	PEO-259	5895	Dibenzo(a,h)anthracene	8270D SIM	Approved
Low Level PAHs	PEO-259	6265	Fluoranthene	8270D SIM	Approved
Low Level PAHs	PEO-259	6270	Fluorene	8270D SIM	Approved
Low Level PAHs	PEO-259	6315	Indeno(1,2,3-cd) pyrene	8270D SIM	Approved
Low Level PAHs	PEO-259	5005	Naphthalene	8270D SIM	Approved
Low Level PAHs	PEO-259	6615	Penanthrene	8270D SIM	Approved
Low Level PAHs	PEO-259	6665	Pyrene	8270D SIM	Approved
			2-Methylnaphthalene	8270D SIM	Approved
2,3,7,8-Tetrachlorodibenzo-p-dioxin	38186	9618	2,3,7,8-TCDD	8290	Approved
Dioxin	PEO-258	9519	1,2,3,4,6,7,8,9-OCDD	8290	Approved
Dioxin	PEO-258	9516	1,2,3,4,6,7,8,9-OCDF	8290	Approved
Dioxin	PEO-258	9426	1,2,3,4,6,7,8-Hpcdd	8290	Approved
Dioxin	PEO-258	9420	1,2,3,4,6,7,8-Hpcdf	8290	Approved
Dioxin	PEO-258	9423	1,2,3,4,7,8,9-Hpcdf	8290	Approved
Dioxin	PEO-258	9453	1,2,3,4,7,8-Hxcdd	8290	Approved
Dioxin	PEO-258	9471	1,2,3,4,7,8-Hxcdf	8290	Approved
Dioxin	PEO-258	9456	1,2,3,6,7,8-Hxcdd	8290	Approved
Dioxin	PEO-258	9474	1,2,3,6,7,8-Hxcdf	8290	Approved
Dioxin	PEO-258	9459	1,2,3,7,8,9-Hxcdd	8290	Approved
Dioxin	PEO-258	9477	1,2,3,7,8,9-Hxcdf	8290	Approved
Dioxin	PEO-258	9540	1,2,3,7,8-Pecdd	8290	Approved
Dioxin	PEO-258	9543	1,2,3,7,8-Pecdf	8290	Approved
Dioxin	PEO-258	9480	2,3,4,6,7,8-Hxcdf	8290	Approved
Dioxin	PEO-258	9549	2,3,4,7,8-Pecdf	8290	Approved
Dioxin	PEO-258	9606	2,3,7,8-TCDD	8290	Approved
Dioxin	PEO-258	9612	2,3,7,8-TCDF	8290	Approved
Dioxin	PEO-258	9438	Hpcdd, total	8290	Approved
Dioxin	PEO-258	9444	Hpcdf, total	8290	Approved

Dioxin	PEO-258	9468	Hxcdd, total	8290	Approved
Dioxin	PEO-258	9483	Hxcdf, total	8290	Approved
Dioxin	PEO-258	9556	PCDD + PCDF, total	8290	Approved
Dioxin	PEO-258	9991	PCDD, total	8290	Approved
Dioxin	PEO-258	9993	PCDF, total	8290	Approved
Dioxin	PEO-258	9555	Pecdd, total	8290	Approved
Dioxin	PEO-258	9552	Pecdf, total	8290	Approved
Dioxin	PEO-258	9609	TCDD, total	8290	Approved
Dioxin	PEO-258	9615	TCDF, total	8290	Approved
WP Carbamates	38156	7710	3-Hydroxycarbofuran	8321A	Approved
WP Carbamates	38156	7010	Aldicarb	8321A	Approved
WP Carbamates	38156	7015	Aldicarb sulfone	8321A	Approved
WP Carbamates	38156	7020	Aldicarb sulfoxide	8321A	Approved
NPTA			Barban	8321A	Approved
NPTA			Bromacil	8321A	Approved
WP Carbamates	38156	7195	Carbaryl	8321A	Approved
WP Carbamates	38156	7205	Carbofuran	8321A	Approved
NPTA			Chloroxuron	8321A	Approved
WP Carbamates	38156	7505	Diuron	8321A	Approved
NPTA			Linuron	8321A	Approved
WP Carbamates	38156	7800	Methiocarb	8321A	Approved
WP Carbamates	38156	7805	Methomyl	8321A	Approved
WP Carbamates	38156	7940	Oxamyl	8321A	Approved
WP Carbamates	38156	8075	Propham	8321A	Approved
WP Carbamates	38156	8080	Propoxur (Baygon)	8321A	Approved
CWA Nitroaromatics in Water	38172	6885	1,3,5-Trinitrobenzene	8330A	Approved
CWA Nitroaromatics in Water	38172	6160	1,3-Dinitrobenzene	8330A	Approved
CWA Nitroaromatics in Water	38172	9651	2,4,6-Trinitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	6185	2,4-Dinitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	6190	2,6-Dinitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9303	2-Amino-4,6-dinitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9507	2-Nitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9510	3-Nitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9306	4-Amino-2,6-dinitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9513	4-Nitrotoluene	8330A	Approved
CWA Nitroaromatics in Water	38172	9522	HMX	8330A	Approved
CWA Nitroaromatics in Water	38172	5015	Nitrobenzene	8330A	Approved
NPTA			Nitroglycerin	8330A	Approved
NPTA			PETN	8330A	Approved
NPTA			PGDN	8330A	Approved
NPTA			Picric Acid	8330A	Approved
CWA Nitroaromatics in Water	38172	9432	RDX	8330A	Approved
CWA Nitroaromatics in Water	38172	6415	Tetryl	8330A	Approved
CWA Nitroaromatics in Water	38172	6885	1,3,5-Trinitrobenzene	8330B	Approved
CWA Nitroaromatics in Water	38172	6160	1,3-Dinitrobenzene	8330B	Approved
CWA Nitroaromatics in Water	38172	9651	2,4,6-Trinitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	6185	2,4-Dinitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	6190	2,6-Dinitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9303	2-Amino-4,6-dinitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9507	2-Nitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9510	3-Nitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9306	4-Amino-2,6-dinitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9513	4-Nitrotoluene	8330B	Approved
CWA Nitroaromatics in Water	38172	9522	HMX	8330B	Approved
CWA Nitroaromatics in Water	38172	5015	Nitrobenzene	8330B	Approved
NPTA			Nitroglycerin	8330B	Approved
NPTA			PGDN	8330B	Approved
NPTA			Picric Acid	8330B	Approved
CWA Nitroaromatics in Water	38172	9432	RDX	8330B	Approved
CWA Nitroaromatics in Water	38172	6415	Tetryl	8330B	Approved
Low Level Nit/Nit	PEO-251	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	8330B	Approved
Low Level Nit/Nit	PEO-251	6160	1,3-Dinitrobenzene (1,3-DNB)	8330B	Approved
Low Level Nit/Nit	PEO-251	9651	2,4,6-Trinitrotoluene (2,4,6-TNT)	8330B	Approved
Low Level Nit/Nit	PEO-251	6185	2,4-Dinitrotoluene (2,4-DNT)	8330B	Approved
Low Level Nit/Nit	PEO-251	6190	2,6-Dinitrotoluene (2,6-DNT)	8330B	Approved
Low Level Nit/Nit	PEO-251	9303	2-Amino-4,6-dinitrotoluene (2am-dnt)	8330B	Approved
Low Level Nit/Nit	PEO-251	9507	2-Nitrotoluene	8330B	Approved
Low Level Nit/Nit	PEO-251	9510	3-Nitrotoluene	8330B	Approved
Low Level Nit/Nit	PEO-251	9306	4-Amino-2,6-dinitrotoluene (4am-dnt)	8330B	Approved
Low Level Nit/Nit	PEO-251	9513	4-Nitrotoluene	8330B	Approved
Low Level Nit/Nit	PEO-251	9522	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8330B	Approved
Low Level Nit/Nit	PEO-251	5015	Nitrobenzene	8330B	Approved
Low Level Nit/Nit	PEO-251	6485	Nitroglycerin	8330B	Approved
Low Level Nit/Nit	PEO-251	9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	8330B	Approved
Low Level Nit/Nit	PEO-251	6415	Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	8330B	Approved
Low Level Nit/Nit	PEO-252	9558	PETN	8330B	Approved
WP Cyanide, Total & Amenable	55132	1645	Total Cyanide	9010B	Approved
WP Cyanide, Total & Amenable	55132	1645	Total Cyanide	9010C & 9014	Approved
WP pH @ 25C	55061	1900	pH	9040B	Approved
WP pH @ 25C	55061	1900	pH	9040C	Approved
WP & DMRQA Nutrients	55035	1810	Nitrate as N	9056	Approved
WP & DMRQA Nutrients	55035	1870	Orthophosphate as P	9056	Approved

WP Nitrate & Nitrite	55130	1810	Nitrate as N	9056	Approved
WP Nitrate & Nitrite	55130	1820	Nitrite + Nitrate as N	9056	Approved
WP Nitrate & Nitrite	55130	1840	Nitrite as N	9056	Approved
SWA Anions	55131	1540	Bromide	9056	Approved
WP Minerals #1	55144	1575	Chloride	9056	Approved
WP Minerals #2	55145	1730	Fluoride	9056	Approved
WP Minerals #2	55145	2000	Sulfate	9056	Approved
WP & DMRQA Nutrients	55035	1810	Nitrate as N	9056A	Approved
WP & DMRQA Nutrients	55035	1870	Orthophosphate as P	9056A	Approved
WP Nitrate & Nitrite	55130	1810	Nitrate as N	9056A	Approved
WP Nitrate & Nitrite	55130	1820	Nitrite + Nitrate as N	9056A	Approved
WP Nitrate & Nitrite	55130	1840	Nitrite as N	9056A	Approved
SWA Anions	55131	1540	Bromide	9056A	Approved
WP Minerals #1	55144	1575	Chloride	9056A	Approved
WP Minerals #2	55145	1730	Fluoride	9056A	Approved
WP Minerals #2	55145	2000	Sulfate	9056A	Approved
WP & DMRQA Demands	55055	2040	Total Organic Carbon	9060	Approved
CWA UV 254 Absorbance/DOC	55088	1710	Dissolved Organic Carbon	9060	Approved
WP & DMRQA Demands	55055	2040	Total Organic Carbon	9060A	Approved
CWA UV 254 Absorbance/DOC	55088	1710	Dissolved Organic Carbon	9060A	Approved
~~Fluoride~~	~~4420~~	~~1730~~	~~Fluoride~~	~~9214~~	Approved
WP Minerals #2	55145	1505	Total Alkalinity (CaCO3)	SM 2320B	Approved
Minerals	4050	1610	Conductivity	SM 2510B	Approved
WP Conductance @ 25C	55026	1610	Specific Conductance	SM 2510B	Approved
Solids (Total Solids, TSS & TDS)	55085	1955	Total Dissolved Solids (TDS)	SM 2540C	Approved
WP Minerals #1	55144	1955	Total Dissolved Solids @ 180C	SM 2540C	Approved
Sulphide	55042	2005	Sulphide	SM 4500-S2F	Approved
Minerals	PEI-257	2005	Sulfide	SM 4500-S2F	Approved
WP & DMRQA Demands	55055	2040	Total Organic Carbon	SM 5310B	Approved
CWA UV 254 Absorbance/DOC	55088	1710	Dissolved Organic Carbon	SM 5310B	Approved
Miscellaneous Analytes	PEI-029	1860	Oil & Grease	SM 5520B	Approved
Total Petroleum Hydrocarbons (TPH) in Water	642	1935	TPH (Gravimetric)	SM 5520BF	Approved
WP MBAS	55083	2025	MBAS	SM 5540C	Approved
MBAS	55106	2025	MBAS	SM 5540C	Approved
NPTA			Ethane, Ethene, Methane	RSK175	Approved
Solids	4030	1960	Total Suspended Solids	SM 2540D	Approved
Solids (Total Solids, TSS & TDS)	55085	1960	Non-Filterable Residue (TSS)	SM 2540D	Approved

Accredited Analytes/Methods

WS Proficiency Testing Summary

Lab Name : **APPL, Inc.**

City/State : **Clovis, CA**

PartName	PartNumber	NELACCode	AnalyteName	EPA Method	PT Results
WS Minerals Mix #2	55123	1955	Total Filterable Residue	160.1	Approved
SDWA Solids (Total Solids, TSS & TDS)	55161	1955	Total Dissolved Solids	160.1	Approved
WS Chromium VI	55112	1045	Chromium VI	218.6	Approved
WS Inorganic Disinfection By-Products	55010	1540	Bromide	300.0	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1730	Fluoride	300.0	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1820	Nitrate and Nitrite as N	300.0	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1810	Nitrate as N	300.0	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1840	Nitrite as N	300.0	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1870	Orthophosphate as P	300.0	Approved
WS Sulphate/TOC	55070	2000	Sulfate	300.0	Approved
WS Minerals Mix #1	55122	1575	Chloride	300.0	Approved
WS Perchlorate	55099	1895	Perchlorate	314.0	Approved
SDWA Nutrients	55165	1515	Ammonia as N	350.1	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1820	Nitrate and Nitrite as N	353.2	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1810	Nitrate as N	353.2	Approved
WS NO3-, NO2-, F, PO4-3, and NO3- & NO2- as N	55011	1840	Nitrite as N	353.2	Approved
WS Perchlorate	55099	1895	Perchlorate	6850	Approved
WS pH @ 25C	55016	1900	pH @ 25	9040C	Approved
WS Minerals Mix #1	55122	1505	Alkalinity	SM 2320B	Approved
WS Minerals Mix #2	55123	1955	Total Filterable Residue	SM 2540C	Approved
SDWA Solids (Total Solids, TSS, & TDS)	55161	1955	Total Dissolved Solids	SM 2540C	Approved
WS Sulphate/TOC	55070	2040	TOC	SM 5310B	Approved
WS UV 254 Absorbance/DOC	55098	1710	Dissolved Organic Carbon (DOC)	SM 5310B	Approved
WS MBAS	55106	2025	MBAS	SM 5540C	Approved
Solids	5150	1960	Total Suspended Solids	SM 2540D	Approved
SDWA Solids (Total Solids, TSS, & TDS)	55161	1960	Non-Filterable Residue (TSS)	SM 2540D	Approved
Trace Metals	5070	1095	Mercury	EPA 245.1	Approved
WS Trace Elements Amp1	55012	1095	Mercury	EPA 245.1	Approved

Accredited Analytes/Methods
UST: Water Proficiency Testing Summary

Lab Name :	APPL, Inc.
City/State :	Clovis, CA

PartName	PartNumber	NELACCode	AnalyteName	EPA Method	PT Results
Petroleum Hydrocarbons in Water	PEO-010	102	Gasoline Range Organics, C6-C10	EPA 8015B	Approved
Petroleum Hydrocarbons in Water	PEO-010	9408	Gasoline Range Organics, C6-C10	EPA 8015C	Approved
Petroleum Hydrocarbons in Water	PEO-010	9408	Gasoline Range Organics, C6-C10	EPA 8015D	Approved
Petroleum Hydrocarbons in Wastewater	PEO-011	9369	Diesel Range Organics (DRO)	EPA 8015B	Approved
Petroleum Hydrocarbons in Wastewater	PEO-011	9369	Diesel range organics, C10-C28	EPA 8015B	Approved
GRO/BTEX in Water	PEO-114AK	4375	Benzene	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	4765	Ethylbenzene	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	5240	m+p-Xylene	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	5000	MTBE	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	5250	o-Xylene	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	5140	Toluene	EPA 8260B	Approved
GRO/BTEX in Water	PEO-114AK	5260	Xylene, total	EPA 8260B	Approved

Accredited Analytes/Methods

SOIL Proficiency Testing Summary

Lab Name :	**APPL, Inc.**				
City/State :	**Clovis, CA**				

PartName	PartNumber	NELACCode	AnalyteName	EPA Method	PT Results
PCB Congeners in Soil	SPE-068	9070	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	1668A	Approved
PCB Congeners in Soil	SPE-068	9025	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	1668A	Approved
PCB Congeners in Soil	SPE-068	9040	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	1668A	Approved
PCB Congeners in Soil	SPE-068	8980	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	1668A	Approved
PCB Congeners in Soil	SPE-068	8955	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	1668A	Approved
PCB Congeners in Soil	SPE-068	9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	1668A	Approved
PCB Congeners in Soil	SPE-068	9050	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	1668A	Approved
PCB Congeners in Soil	SPE-068	9045	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	1668A	Approved
PCB Congeners in Soil	SPE-068	8985	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	1668A	Approved
PCB Congeners in Soil	SPE-068	9055	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	1668A	Approved
PCB Congeners in Soil	SPE-068	9005	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	1668A	Approved
PCB Congeners in Soil	SPE-068	8995	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	1668A	Approved
PCB Congeners in Soil	SPE-068	9000	2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	1668A	Approved
PCB Congeners in Soil	SPE-068	8936	2,4,4'-Trichlorobiphenyl (PCB 28)	1668A	Approved
PCB Congeners in Soil	SPE-068	9060	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	1668A	Approved
PCB Congeners in Soil	SPE-068	9015	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	1668A	Approved
PCB Congeners in Soil	SPE-068	8965	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	1668A	Approved
PCB Congeners in Soil	SPE-068	8970	3,4,4',5-Tetrachlorobiphenyl (PCB 81)	1668A	Approved
PCB Congeners in Soil	SPE-068	9025	PCB (129)+(138)+(163)	1668A	Approved
PCB Congeners in Soil	SPE-068	9040	PCB (153)+(168)	1668A	Approved
PCB Congeners in Soil	SPE-068	9046	PCB (156)+(157)	1668A	Approved
PCB Congeners in Soil	SPE-068	9070	PCB (180)+(193)	1668A	Approved
PCB Congeners in Soil	SPE-068	8936	PCB (20)+(28)	1668A	Approved
PCB Congeners in Soil	SPE-068	8980	PCB (90)+(101)+(113)	1668A	Approved
PCB Congeners in Soil	SPE-068	8870	PCBs, total	1668A	Approved
RCRA Anions	55141	1540	Bromide (Br)	300.0	Approved
RCRA Anions	55141	1575	Chloride (Cl)	300.0	Approved
RCRA Anions	55141	1730	Fluoride (F)	300.0	Approved
RCRA Anions	55141	1810	Nitrate as N (NO3- as N)	300.0	Approved
RCRA Anions	55141	1870	Phosphate as P (PO43- as P)	300.0	Approved
RCRA Anions	55141	2000	Sulfate (SO42-)	300.0	Approved
RCRA Hexavalent Chromium	55104	1045	Chromium VI	3060A	Approved
RCRA Perchlorate	55143	1895	Perchlorate	314.0	Approved
RCRA Nutrients	55142	1515	Ammonia as N	350.1	Approved
RCRA Nutrients	55142	1795	Total Kjeldhal Nitrogen	351.2	Approved
RCRA Anions	55141	1810	Nitrate as N (NO3 as N)	353.2	Approved
RCRA Metals in Soil #2	55103	1000	Aluminum	6010B	Approved
RCRA Metals in Soil #1	55102	1005	Antimony	6010B	Approved
TCLP Metals	SPE-005	1005	Antimony, Sb	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1005	Antimony, Sb	6010B	Approved
RCRA Metals in Soil #1	55102	1010	Arsenic	6010B	Approved
TCLP Metals	SPE-005	1010	Arsenic, As	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1010	Arsenic, As	6010B	Approved
RCRA Metals in Soil #1	55102	1015	Barium	6010B	Approved
TCLP Metals	SPE-005	1015	Barium, Ba	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1015	Barium, Ba	6010B	Approved
RCRA Metals in Soil #1	55102	1020	Beryllium	6010B	Approved
TCLP Metals	SPE-005	1020	Beryllium, Be	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1020	Beryllium, Be	6010B	Approved
RCRA Metals in Soil #1	55102	1025	Boron	6010B	Approved
RCRA Metals in Soil #1	55102	1030	Cadmium	6010B	Approved
TCLP Metals	SPE-005	1030	Cadmium, Cd	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1030	Cadmium, Cd	6010B	Approved
RCRA Metals in Soil #2	55103	1035	Calcium	6010B	Approved
RCRA Metals in Soil #1	55102	1040	Chromium	6010B	Approved
TCLP Metals	SPE-005	1040	Chromium, Cr (total)	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1040	Chromium, Cr (total)	6010B	Approved
RCRA Metals in Soil #1	55102	1050	Cobalt	6010B	Approved
TCLP Metals	SPE-005	1050	Cobalt, Co	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1050	Cobalt, Co	6010B	Approved
RCRA Metals in Soil #1	55102	1055	Copper	6010B	Approved
TCLP Metals	SPE-005	1055	Copper, Cu	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1055	Copper, Cu	6010B	Approved
RCRA Metals in Soil #2	55103	1070	Iron	6010B	Approved
RCRA Metals in Soil #1	55102	1075	Lead	6010B	Approved
TCLP Metals	SPE-005	1075	Lead, Pb	6010B	Approved

TCLP Metals in Soil - CA WET	SPE-006	1075	Lead, Pb	6010B	Approved
RCRA Metals in Soil #2	55103	1085	Magnesium	6010B	Approved
RCRA Metals in Soil #1	55102	1090	Manganese	6010B	Approved
RCRA Metals in Soil #1	55102	1100	Molybdenum	6010B	Approved
TCLP Metals	SPE-005	1100	Molybdenum, Mo	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1100	Molybdenum, Mo	6010B	Approved
RCRA Metals in Soil #1	55102	1105	Nickel	6010B	Approved
TCLP Metals	SPE-005	1105	Nickel, Ni	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1105	Nickel, Ni	6010B	Approved
RCRA Metals in Soil #2	55103	1125	Potassium	6010B	Approved
RCRA Metals in Soil #1	55102	1140	Selenium	6010B	Approved
TCLP Metals	SPE-005	1140	Selenium, Se	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1140	Selenium, Se	6010B	Approved
RCRA Metals in Soil #1	55102	1150	Silver	6010B	Approved
TCLP Metals	SPE-005	1150	Silver, Ag	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1150	Silver, Ag	6010B	Approved
RCRA Metals in Soil #2	55103	1155	Sodium	6010B	Approved
RCRA Metals in Soil #1	55102	1160	Strontium	6010B	Approved
RCRA Metals in Soil #1	55102	1165	Thallium	6010B	Approved
TCLP Metals	SPE-005	1165	Thallium, Tl	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1165	Thallium, Tl	6010B	Approved
RCRA Metals in Soil #1	55102	1175	Tin	6010B	Approved
RCRA Metals in Soil #1	55102	1180	Titanium	6010B	Approved
RCRA Nutrients	55142	1910	Total Phosphorus	6010B	Approved
RCRA Metals in Soil #1	55102	1185	Vanadium	6010B	Approved
TCLP Metals	SPE-005	1185	Vanadium, V	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1185	Vanadium, V	6010B	Approved
RCRA Metals in Soil #1	55102	1190	Zinc	6010B	Approved
TCLP Metals	SPE-005	1190	Zinc, Zn	6010B	Approved
TCLP Metals in Soil - CA WET	SPE-006	1190	Zinc, Zn	6010B	Approved
RCRA Metals in Soil #2	55103	1000	Aluminum	6010C	Approved
RCRA Metals in Soil #1	55102	1005	Antimony	6010C	Approved
RCRA Metals in Soil #1	55102	1010	Arsenic	6010C	Approved
RCRA Metals in Soil #1	55102	1015	Barium	6010C	Approved
RCRA Metals in Soil #1	55102	1020	Beryllium	6010C	Approved
RCRA Metals in Soil #1	55102	1025	Boron	6010C	Approved
RCRA Metals in Soil #1	55102	1030	Cadmium	6010C	Approved
RCRA Metals in Soil #2	55103	1035	Calcium	6010C	Approved
RCRA Metals in Soil #1	55102	1040	Chromium	6010C	Approved
RCRA Metals in Soil #1	55102	1050	Cobalt	6010C	Approved
RCRA Metals in Soil #1	55102	1055	Copper	6010C	Approved
RCRA Metals in Soil #2	55103	1070	Iron	6010C	Approved
RCRA Metals in Soil #1	55102	1075	Lead	6010C	Approved
RCRA Metals in Soil #2	55103	1085	Magnesium	6010C	Approved
RCRA Metals in Soil #1	55102	1090	Manganese	6010C	Approved
RCRA Metals in Soil #1	55102	1100	Molybdenum	6010C	Approved
RCRA Metals in Soil #1	55102	1105	Nickel	6010C	Approved
RCRA Metals in Soil #2	55103	1125	Potassium	6010C	Approved
RCRA Metals in Soil #1	55102	1140	Selenium	6010C	Approved
RCRA Metals in Soil #1	55102	1150	Silver	6010C	Approved
RCRA Metals in Soil #2	55103	1155	Sodium	6010C	Approved
RCRA Metals in Soil #1	55102	1160	Strontium	6010C	Approved
RCRA Metals in Soil #1	55102	1165	Thallium	6010C	Approved
RCRA Metals in Soil #1	55102	1175	Tin	6010C	Approved
RCRA Metals in Soil #1	55102	1180	Titanium	6010C	Approved
			Total Phosphorus	6010C	Approved
RCRA Metals in Soil #1	55102	1185	Vanadium	6010C	Approved
RCRA Metals in Soil #1	55102	1190	Zinc	6010C	Approved
NPTA			Zirconium	6010C	Approved
RCRA Metals in Soil #2	55103	1000	Aluminum	6020	Approved
RCRA Metals in Soil #1	55102	1005	Antimony	6020	Approved
RCRA Metals in Soil #1	55102	1010	Arsenic	6020	Approved
RCRA Metals in Soil #1	55102	1015	Barium	6020	Approved
RCRA Metals in Soil #1	55102	1020	Beryllium	6020	Approved
RCRA Metals in Soil #1	55102	1025	Boron	6020	Approved
RCRA Metals in Soil #1	55102	1030	Cadmium	6020	Approved
RCRA Metals in Soil #2	55103	1035	Calcium	6020	Approved
RCRA Metals in Soil #1	55102	1040	Chromium	6020	Approved
RCRA Metals in Soil #1	55102	1050	Cobalt	6020	Approved
RCRA Metals in Soil #1	55102	1055	Copper	6020	Approved
RCRA Metals in Soil #2	55103	1070	Iron	6020	Approved
RCRA Metals in Soil #1	55102	1075	Lead	6020	Approved
RCRA Metals in Soil #2	55103	1085	Magnesium	6020	Approved
RCRA Metals in Soil #1	55102	1090	Manganese	6020	Approved

RCRA Metals in Soil #1	55102	1100	Molybdenum	6020	Approved
RCRA Metals in Soil #1	55102	1105	Nickel	6020	Approved
RCRA Metals in Soil #2	55103	1125	Potassium	6020	Approved
RCRA Metals in Soil #1	55102	1140	Selenium	6020	Approved
RCRA Metals in Soil #1	55102	1150	Silver	6020	Approved
RCRA Metals in Soil #2	55103	1155	Sodium	6020	Approved
RCRA Metals in Soil #1	55102	1160	Strontium	6020	Approved
RCRA Metals in Soil #1	55102	1165	Thallium	6020	Approved
RCRA Metals in Soil #1	55102	1175	Tin	6020	Approved
RCRA Metals in Soil #1	55102	1180	Titanium	6020	Approved
RCRA Metals in Soil #1	55102	1185	Vanadium	6020	Approved
RCRA Metals in Soil #1	55102	1190	Zinc	6020	Approved
NPTA			Zirconium	6020	Approved
RCRA Metals in Soil #2	55103	1000	Aluminum	6020A	Approved
RCRA Metals in Soil #1	55102	1005	Antimony	6020A	Approved
RCRA Metals in Soil #1	55102	1010	Arsenic	6020A	Approved
RCRA Metals in Soil #1	55102	1015	Barium	6020A	Approved
RCRA Metals in Soil #1	55102	1020	Beryllium	6020A	Approved
RCRA Metals in Soil #1	55102	1025	Boron	6020A	Approved
RCRA Metals in Soil #1	55102	1030	Cadmium	6020A	Approved
RCRA Metals in Soil #2	55103	1035	Calcium	6020A	Approved
RCRA Metals in Soil #1	55102	1040	Chromium	6020A	Approved
RCRA Metals in Soil #1	55102	1050	Cobalt	6020A	Approved
RCRA Metals in Soil #1	55102	1055	Copper	6020A	Approved
RCRA Metals in Soil #2	55103	1070	Iron	6020A	Approved
RCRA Metals in Soil #1	55102	1075	Lead	6020A	Approved
RCRA Metals in Soil #2	55103	1085	Magnesium	6020A	Approved
RCRA Metals in Soil #1	55102	1090	Manganese	6020A	Approved
RCRA Metals in Soil #1	55102	1100	Molybdenum	6020A	Approved
RCRA Metals in Soil #1	55102	1105	Nickel	6020A	Approved
RCRA Metals in Soil #2	55103	1125	Potassium	6020A	Approved
RCRA Metals in Soil #1	55102	1140	Selenium	6020A	Approved
RCRA Metals in Soil #1	55102	1150	Silver	6020A	Approved
RCRA Metals in Soil #2	55103	1155	Sodium	6020A	Approved
RCRA Metals in Soil #1	55102	1160	Strontium	6020A	Approved
RCRA Metals in Soil #1	55102	1165	Thallium	6020A	Approved
RCRA Metals in Soil #1	55102	1175	Tin	6020A	Approved
RCRA Metals in Soil #1	55102	1180	Titanium	6020A	Approved
RCRA Metals in Soil #1	55102	1185	Vanadium	6020A	Approved
RCRA Metals in Soil #1	55102	1190	Zinc	6020A	Approved
NPTA			Zirconium	6020A	Approved
RCRA Perchlorate	55143	1895	Perchlorate	6850	Approved
RCRA Hexavalent Chromium	55104	1045	Chromium VI	7196A	Approved
RCRA Hexavalent Chromium	55104	1045	Chromium VI	7199	Approved
TCLP Metals	SPE-005	1095	Mercury, Hg	7470A	Approved
TCLP Metals in Soil - CA WET	SPE-006	1095	Mercury, Hg	7470A	Approved
RCRA Metals in Soil #1	55102	1095	Mercury	7471B	Approved
Petroleum Hydrocarbons in Soil	SPE-007	9369	Diesel Range Organics C10-C28	8015B	Approved
Petroleum Hydrocarbons in Soil	SPE-007	9369	Diesel Range Organics C10-C28	8015C	Approved
Petroleum Hydrocarbons in Soil	SPE-007	9369	Diesel Range Organics C10-C28	8015D	Approved
Petroleum Hydrocarbons in Soil	SPE-008	101	Gasoline Range Organics, C6-C10	8015B	Approved
Petroleum Hydrocarbons in Soil	SPE-008	101	Total Purgeable Hydrocarbons	8015B	Approved
Petroleum Hydrocarbons in Soil	SPE-008	9408	Gasoline Range Organics, C6-C10	8015C	Approved
Petroleum Hydrocarbons in Soil	SPE-008	99990	Total Purgeable Hydrocarbons	8015C	Approved
Petroleum Hydrocarbons in Soil	SPE-008	9408	Gasoline Range Organics, C6-C10	8015D	Approved
Petroleum Hydrocarbons in Soil	SPE-008	99990	Total Purgeable Hydrocarbons	8015D	Approved
Toxaphene in Soil	38066	8250	Toxaphene	8081A	Approved
Chlorinated Pesticides in Soil	38101	7355	4,4'-DDD	8081A	Approved
Chlorinated Pesticides in Soil	38101	7360	4,4'-DDE	8081A	Approved
Chlorinated Pesticides in Soil	38101	7365	4,4'-DDT	8081A	Approved
Chlorinated Pesticides in Soil	38101	7110	a-BHC	8081A	Approved
Chlorinated Pesticides in Soil	38101	7240	a-Chlordane	8081A	Approved
Chlorinated Pesticides in Soil	38101	7025	Aldrin	8081A	Approved
Chlorinated Pesticides in Soil	38101	7115	b-BHC	8081A	Approved
Chlorinated Pesticides in Soil	38101	7105	d-BHC	8081A	Approved
Chlorinated Pesticides in Soil	38101	7470	Dieldrin	8081A	Approved
Chlorinated Pesticides in Soil	38101	7510	Endosulfan I	8081A	Approved
Chlorinated Pesticides in Soil	38101	7515	Endosulfan II	8081A	Approved
Chlorinated Pesticides in Soil	38101	7520	Endosulfan sulfate	8081A	Approved
Chlorinated Pesticides in Soil	38101	7540	Endrin	8081A	Approved
Chlorinated Pesticides in Soil	38101	7530	Endrin aldehyde	8081A	Approved
Chlorinated Pesticides in Soil	38101	7535	Endrin ketone	8081A	Approved
Chlorinated Pesticides in Soil	38101	7120	g-BHC (Lindane)	8081A	Approved
Chlorinated Pesticides in Soil	38101	7245	g-Chlordane	8081A	Approved

Chlorinated Pesticides in Soil	38101	7685	Heptachlor	8081A	Approved
Chlorinated Pesticides in Soil	38101	7690	Heptachlor epoxide	8081A	Approved
Chlorinated Pesticides in Soil	38101	7810	Methoxychlor	8081A	Approved
Chlordane in Soil	38141	7250	Chlordane	8081A	Approved
Toxaphene in Soil	38066	8250	Toxaphene	8081B	Approved
Chlorinated Pesticides in Soil	38101	7355	4,4'-DDD	8081B	Approved
Chlorinated Pesticides in Soil	38101	7360	4,4'-DDE	8081B	Approved
Chlorinated Pesticides in Soil	38101	7365	4,4'-DDT	8081B	Approved
Chlorinated Pesticides in Soil	38101	7110	a-BHC	8081B	Approved
Chlorinated Pesticides in Soil	38101	7240	a-Chlordane	8081B	Approved
Chlorinated Pesticides in Soil	38101	7025	Aldrin	8081B	Approved
Chlorinated Pesticides in Soil	38101	7115	b-BHC	8081B	Approved
Chlorinated Pesticides in Soil	38101	7105	d-BHC	8081B	Approved
Chlorinated Pesticides in Soil	38101	7470	Dieldrin	8081B	Approved
Chlorinated Pesticides in Soil	38101	7510	Endosulfan I	8081B	Approved
Chlorinated Pesticides in Soil	38101	7515	Endosulfan II	8081B	Approved
Chlorinated Pesticides in Soil	38101	7520	Endosulfan sulfate	8081B	Approved
Chlorinated Pesticides in Soil	38101	7540	Endrin	8081B	Approved
Chlorinated Pesticides in Soil	38101	7530	Endrin aldehyde	8081B	Approved
Chlorinated Pesticides in Soil	38101	7535	Endrin ketone	8081B	Approved
Chlorinated Pesticides in Soil	38101	7120	g-BHC (Lindane)	8081B	Approved
Chlorinated Pesticides in Soil	38101	7245	g-Chlordane	8081B	Approved
Chlorinated Pesticides in Soil	38101	7685	Heptachlor	8081B	Approved
Chlorinated Pesticides in Soil	38101	7690	Heptachlor epoxide	8081B	Approved
Chlorinated Pesticides in Soil	38101	7810	Methoxychlor	8081B	Approved
Chlordane in Soil	38141	7250	Chlordane	8081B	Approved
PCBs in Transformer Oil #2	38092	8880	PCB in Oil 1016	8082	Approved
PCBs in Transformer Oil #2	38092	8895	PCB in Oil 1242	8082	Approved
PCBs in Transformer Oil #2	38092	8905	PCB in Oil 1254	8082	Approved
PCBs in Transformer Oil #2	38092	8910	PCB in Oil 1260	8082	Approved
PCBs in Transformer Oil #2	38095	8880	PCB in Oil 1016	8082	Approved
PCBs in Transformer Oil #2	38095	8895	PCB in Oil 1242	8082	Approved
PCBs in Transformer Oil #2	38095	8905	PCB in Oil 1254	8082	Approved
PCBs in Transformer Oil #2	38095	8910	PCB in Oil 1260	8082	Approved
Aroclor in Soil	38142	8880	Aroclor 1016	8082	Approved
Aroclor in Soil	38142	8885	Aroclor 1221	8082	Approved
Aroclor in Soil	38142	8890	Aroclor 1232	8082	Approved
Aroclor in Soil	38142	8895	Aroclor 1242	8082	Approved
Aroclor in Soil	38142	8900	Aroclor 1248	8082	Approved
Aroclor in Soil	38142	8905	Aroclor 1254	8082	Approved
Aroclor in Soil	38142	8910	Aroclor 1260	8082	Approved
PCB in Soil	SPE-010	8912	Aroclor 1016/1242	8082	Approved
PCB in Soil	SPE-010	8880	Aroclor-1016 (PCB-1016)	8082	Approved
PCB in Soil	SPE-010	8885	Aroclor-1221 (PCB-1221)	8082	Approved
PCB in Soil	SPE-010	8890	Aroclor-1232 (PCB-1232)	8082	Approved
PCB in Soil	SPE-010	8895	Aroclor-1242 (PCB-1242)	8082	Approved
PCB in Soil	SPE-010	8900	Aroclor-1248 (PCB-1248)	8082	Approved
PCB in Soil	SPE-010	8905	Aroclor-1254 (PCB-1254)	8082	Approved
PCB in Soil	SPE-010	8910	Aroclor-1260 (PCB-1260)	8082	Approved
PCB in Soil	SPE-010	8912	Aroclor 1016/1242	8082	Approved
PCB in Soil	SPE-010	8880	Aroclor-1016 (PCB-1016)	8082	Approved
PCB in Soil	SPE-010	8885	Aroclor-1221 (PCB-1221)	8082	Approved
PCB in Soil	SPE-010	8890	Aroclor-1232 (PCB-1232)	8082	Approved
PCB in Soil	SPE-010	8895	Aroclor-1242 (PCB-1242)	8082	Approved
PCB in Soil	SPE-010	8900	Aroclor-1248 (PCB-1248)	8082	Approved
PCB in Soil	SPE-010	8905	Aroclor-1254 (PCB-1254)	8082	Approved
PCB in Soil	SPE-010	8910	Aroclor-1260 (PCB-1260)	8082	Approved
PCBs in Transformer Oil #2	38092	8880	PCB in Oil 1016	8082A	Approved
PCBs in Transformer Oil #2	38092	8895	PCB in Oil 1242	8082A	Approved
PCBs in Transformer Oil #2	38092	8905	PCB in Oil 1254	8082A	Approved
PCBs in Transformer Oil #2	38092	8910	PCB in Oil 1260	8082A	Approved
PCBs in Transformer Oil #2	38095	8880	PCB in Oil 1016	8082A	Approved
PCBs in Transformer Oil #2	38095	8895	PCB in Oil 1242	8082A	Approved
PCBs in Transformer Oil #2	38095	8905	PCB in Oil 1254	8082A	Approved
PCBs in Transformer Oil #2	38095	8910	PCB in Oil 1260	8082A	Approved
Aroclor in Soil	38142	8880	Aroclor 1016	8082A	Approved
Aroclor in Soil	38142	8885	Aroclor 1221	8082A	Approved
Aroclor in Soil	38142	8890	Aroclor 1232	8082A	Approved
Aroclor in Soil	38142	8895	Aroclor 1242	8082A	Approved
Aroclor in Soil	38142	8900	Aroclor 1248	8082A	Approved
Aroclor in Soil	38142	8905	Aroclor 1254	8082A	Approved
Aroclor in Soil	38142	8910	Aroclor 1260	8082A	Approved
PCB in Soil	SPE-010	8912	Aroclor 1016/1242	8082A	Approved
PCB in Soil	SPE-010	8880	Aroclor-1016 (PCB-1016)	8082A	Approved

PCB in Soil	SPE-010	8885	Aroclor-1221 (PCB-1221)	8082A	Approved
PCB in Soil	SPE-010	8890	Aroclor-1232 (PCB-1232)	8082A	Approved
PCB in Soil	SPE-010	8895	Aroclor-1242 (PCB-1242)	8082A	Approved
PCB in Soil	SPE-010	8900	Aroclor-1248 (PCB-1248)	8082A	Approved
PCB in Soil	SPE-010	8905	Aroclor-1254 (PCB-1254)	8082A	Approved
PCB in Soil	SPE-010	8910	Aroclor-1260 (PCB-1260)	8082A	Approved
PCB in Soil	SPE-010	8912	Aroclor 1016/1242	8082A	Approved
PCB in Soil	SPE-010	8880	Aroclor-1016 (PCB-1016)	8082A	Approved
PCB in Soil	SPE-010	8885	Aroclor-1221 (PCB-1221)	8082A	Approved
PCB in Soil	SPE-010	8890	Aroclor-1232 (PCB-1232)	8082A	Approved
PCB in Soil	SPE-010	8895	Aroclor-1242 (PCB-1242)	8082A	Approved
PCB in Soil	SPE-010	8900	Aroclor-1248 (PCB-1248)	8082A	Approved
PCB in Soil	SPE-010	8905	Aroclor-1254 (PCB-1254)	8082A	Approved
PCB in Soil	SPE-010	8910	Aroclor-1260 (PCB-1260)	8082A	Approved
OrganoPhosphorus Pesticides	38151	7075	Azinphosmethyl	8141A	Approved
OrganoPhosphorus Pesticides	38151	7390	Demeton, (Mix of Isomers O:S)	8141A	Approved
OrganoPhosphorus Pesticides	38151	7410	Diazinon	8141A	Approved
OrganoPhosphorus Pesticides	38151	8625	Disulfoton	8141A	Approved
OrganoPhosphorus Pesticides	38151	8110	Fenchlorphos (Ronnel)	8141A	Approved
OrganoPhosphorus Pesticides	38151	7770	Malathion	8141A	Approved
OrganoPhosphorus Pesticides	38151	7955	Parathion ethyl	8141A	Approved
OrganoPhosphorus Pesticides	38151	7825	Parathion methyl	8141A	Approved
OrganoPhosphorus Pesticides	38151	7985	Phorate	8141A	Approved
OrganoPhosphorus Pesticides	38151	8200	Tetrachlorvinphos (Stirophos)	8141A	Approved
OrganoPhosphorus Pesticides	38151	7075	Azinphosmethyl	8141B	Approved
OrganoPhosphorus Pesticides	38151	7390	Demeton, (Mix of Isomers O:S)	8141B	Approved
OrganoPhosphorus Pesticides	38151	7410	Diazinon	8141B	Approved
OrganoPhosphorus Pesticides	38151	8625	Disulfoton	8141B	Approved
OrganoPhosphorus Pesticides	38151	8110	Fenchlorphos (Ronnel)	8141B	Approved
OrganoPhosphorus Pesticides	38151	7770	Malathion	8141B	Approved
OrganoPhosphorus Pesticides	38151	7955	Parathion ethyl	8141B	Approved
OrganoPhosphorus Pesticides	38151	7825	Parathion methyl	8141B	Approved
OrganoPhosphorus Pesticides	38151	7985	Phorate	8141B	Approved
OrganoPhosphorus Pesticides	38151	8200	Tetrachlorvinphos (Stirophos)	8141B	Approved
Herbicide Acids in Soil	38146	8655	2,4,5-T	8151A	Approved
Herbicide Acids in Soil	38146	8650	2,4,5-TP	8151A	Approved
Herbicide Acids in Soil	38146	8545	2,4-D	8151A	Approved
Herbicide Acids in Soil	38146	8560	2,4-DB	8151A	Approved
Herbicide Acids in Soil	38146	8555	Dalapon	8151A	Approved
Herbicide Acids in Soil	38146	8595	Dicamba	8151A	Approved
Herbicide Acids in Soil	38146	8620	Dinoseb	8151A	Approved
Herbicide Acids in Soil	38146	6605	Pentachlorophenol	8151A	Approved
NPTA			Dichlorprop (2,4-DP)	8151A	Approved
NPTA			MCPA	8151A	Approved
NPTA			MSPP	8151A	Approved
Volatiles in Soil	38084	5105	1,1,1,2-Tetrachloroethane	8260B	Approved
Volatiles in Soil	38084	5160	1,1,1-Trichloroethane	8260B	Approved
Volatiles in Soil	38084	5110	1,1,2,2-Tetrachloroethane	8260B	Approved
Volatiles in Soil	38084	5165	1,1,2-Trichloroethane	8260B	Approved
Volatiles in Soil	38084	4630	1,1-Dichloroethane	8260B	Approved
Volatiles in Soil	38084	4640	1,1-Dichloroethene	8260B	Approved
Volatiles in Soil	38084	4670	1,1-Dichloropropene	8260B	Approved
Volatiles in Soil	38084	5150	1,2,3-Trichlorobenzene	8260B	Approved
Volatiles in Soil	38084	5180	1,2,3-Trichloropropane	8260B	Approved
Volatiles in Soil	38084	5155	1,2,4-Trichlorobenzene	8260B	Approved
Volatiles in Soil	38084	5210	1,2,4-Trimethylbenzene	8260B	Approved
Volatiles in Soil	38084	4570	1,2-Dibromo-3-chloropropane	8260B	Approved
Volatiles in Soil	38084	4585	1,2-Dibromoethane	8260B	Approved
Volatiles in Soil	38084	4610	1,2-Dichlorobenzene	8260B	Approved
Volatiles in Soil	38084	4635	1,2-Dichloroethane	8260B	Approved
Volatiles in Soil	38084	4655	1,2-Dichloropropane	8260B	Approved
Volatiles in Soil	38084	5215	1,3,5-Trimethylbenzene	8260B	Approved
Volatiles in Soil	38084	4615	1,3-Dichlorobenzene	8260B	Approved
Volatiles in Soil	38084	4660	1,3-Dichloropropane	8260B	Approved
Volatiles in Soil	38084	4620	1,4-Dichlorobenzene	8260B	Approved
Volatiles in Soil	38084	4665	2,2-Dichloropropane	8260B	Approved
Volatiles in Soil	38084	4535	2-Chlorotoluene	8260B	Approved
Volatiles in Soil	38084	4540	4-Chlorotoluene	8260B	Approved
Volatiles in Soil	38084	4995	4-Methyl-2-pentanone	8260B	Approved
Volatiles in Soil	38084	4375	Benzene	8260B	Approved
Volatiles in Soil	38084	4385	Bromobenzene	8260B	Approved
Volatiles in Soil	38084	4390	Bromochloromethane	8260B	Approved
Volatiles in Soil	38084	4395	Bromodichloromethane	8260B	Approved
Volatiles in Soil	38084	4400	Bromoform	8260B	Approved

Volatiles in Soil	38084	4950	Bromomethane	8260B	Approved
Volatiles in Soil	38084	4450	Carbon disulphide	8260B	Approved
Volatiles in Soil	38084	4455	Carbon tetrachloride	8260B	Approved
Volatiles in Soil	38084	4475	Chlorobenzene	8260B	Approved
Volatiles in Soil	38084	4485	Chloroethane	8260B	Approved
Volatiles in Soil	38084	4505	Chloroform	8260B	Approved
Volatiles in Soil	38084	4960	Chloromethane	8260B	Approved
Volatiles in Soil	38084	4645	cis-1,2-Dichloroethene	8260B	Approved
Volatiles in Soil	38084	4680	cis-1,3-Dichloropropene	8260B	Approved
Volatiles in Soil	38084	4575	Dibromochloromethane	8260B	Approved
Volatiles in Soil	38084	4595	Dibromomethane	8260B	Approved
Volatiles in Soil	38084	4625	Dichlorodifluoromethane	8260B	Approved
Volatiles in Soil	38084	4765	Ethyl benzene	8260B	Approved
Volatiles in Soil	38084	4835	Hexachlorobutadiene	8260B	Approved
Volatiles in Soil	38084	4840	Hexachloroethane	8260B	Approved
Volatiles in Soil	38084	4900	Isopropylbenzene	8260B	Approved
Volatiles in Soil	38084	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
Volatiles in Soil	38084	4975	Methylene chloride	8260B	Approved
Volatiles in Soil	38084	5005	Naphthalene	8260B	Approved
Volatiles in Soil	38084	4435	n-Butyl benzene	8260B	Approved
Volatiles in Soil	38084	5090	n-Propylbenzene	8260B	Approved
Volatiles in Soil	38084	4910	p-Isopropyl toluene	8260B	Approved
Volatiles in Soil	38084	4440	sec-Butyl benzene	8260B	Approved
Volatiles in Soil	38084	5100	Styrene	8260B	Approved
Volatiles in Soil	38084	4445	tert-Butyl benzene	8260B	Approved
Volatiles in Soil	38084	5140	Toluene	8260B	Approved
Volatiles in Soil	38084	5260	Total Xylenes	8260B	Approved
Volatiles in Soil	38084	4700	trans-1,2-Dichloroethene	8260B	Approved
Volatiles in Soil	38084	5170	Trichloroethene	8260B	Approved
Volatiles in Soil	38084	5175	Trichlorofluoromethane	8260B	Approved
Volatiles in Soil	38084	5235	Vinyl chloride	8260B	Approved
RCRA BTEX & MTBE	38161	4375	Benzene	8260B	Approved
RCRA BTEX & MTBE	38161	4765	Ethyl benzene	8260B	Approved
RCRA BTEX & MTBE	38161	5140	Toluene	8260B	Approved
RCRA BTEX & MTBE	38161	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
RCRA BTEX & MTBE	38161	5260	Total Xylenes	8260B	Approved
RCRA Ketones in Soil	38167	4410	2-Butanone (Methyl ethyl ketone)	8260B	Approved
RCRA Ketones in Soil	38167	4860	2-Hexanone	8260B	Approved
RCRA Ketones in Soil	38167	4995	4-Methyl-2-pentanone	8260B	Approved
RCRA Ketones in Soil	38167	4315	Acetone	8260B	Approved
RCRA Oxygenates	38169	5185	1,1,2-Trichlorotrifluoroethane	8260B	Approved
RCRA Oxygenates	38169	4770	Ethyl tert-butyl ether	8260B	Approved
RCRA Oxygenates	38169	9375	Isopropyl ether	8260B	Approved
RCRA Oxygenates	38169	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
RCRA Oxygenates	38169	5090	n-Propylbenzene	8260B	Approved
RCRA Oxygenates	38169	4370	tert-Amyl methyl ether	8260B	Approved
RCRA Oxygenates	38169	4420	tert-Butyl alcohol (t-Butanol)	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5105	1,1,1,2-Tetrachloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5160	1,1,1-Trichloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5110	1,1,2,2-Tetrachloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5165	1,1,2-Trichloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4630	1,1-Dichloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4640	1,1-Dichloroethene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5180	1,2,3-Trichloropropane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5155	1,2,4-Trichlorobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4570	1,2-Dibromo-3-chloropropane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4585	1,2-Dibromoethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4610	1,2-Dichlorobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4635	1,2-Dichloroethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4655	1,2-Dichloropropane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4615	1,3-Dichlorobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4620	1,4-Dichlorobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4410	2-Butanone (Methyl ethyl ketone)	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4860	2-Hexanone	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4995	4-Methyl-2-pentanone	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4315	Acetone	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4375	Benzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4385	Bromobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4395	Bromodichloromethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4400	Bromoform	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4950	Bromomethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4455	Carbon tetrachloride	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4475	Chlorobenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4485	Chloroethane	8260B	Approved

RCRA Medium Level Volatiles in Soil	38199	4505	Chloroform	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4960	Chloromethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4645	cis-1,2-Dichloroethene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4680	cis-1,3-Dichloropropene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4575	Dibromochloromethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4595	Dibromomethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4625	Dichlorodifluoromethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4765	Ethyl benzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4900	Isopropylbenzene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5000	Methyl tert-butyl ether (MTBE)	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4975	Methylene chloride	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5005	Naphthalene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5100	Styrene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5115	Tetrachloroethene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5140	Toluene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4700	trans-1,2-Dichloroethene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	4685	trans-1,3-Dichloropropene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5170	Trichloroethene	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5175	Trichlorofluoromethane	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5235	Vinyl chloride	8260B	Approved
RCRA Medium Level Volatiles in Soil	38199	5260	Xylenes, total	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	4375	Benzene	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	4765	Ethylbenzene	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	5240	m+p-Xylene	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	5000	MTBE	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	5250	o-Xylene	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	5140	Toluene	8260B	Approved
GRO/BTEX in Soil	SPE-025AK	5260	Xylene, total	8260B	Approved
NPTA			Cyclohexane	8260B	Approved
NPTA			Methyl Acetate	8260B	Approved
NPTA			Methylcyclohexane	8260B	Approved
NPTA			m&p Xylenes	8260B	Approved
NPTA			o-Xylene	8260B	Approved
NPTA			p-isopropyltoluene	8260B	Approved
NPTA			Vinyl Acetate	8260B	Approved
Volatiles in Soil	38084	5105	1,1,1,2-Tetrachloroethane	8260C	Approved
Volatiles in Soil	38084	5160	1,1,1-Trichloroethane	8260C	Approved
Volatiles in Soil	38084	5110	1,1,2,2-Tetrachloroethane	8260C	Approved
Volatiles in Soil	38084	5165	1,1,2-Trichloroethane	8260C	Approved
Volatiles in Soil	38084	4630	1,1-Dichloroethane	8260C	Approved
Volatiles in Soil	38084	4640	1,1-Dichloroethene	8260C	Approved
Volatiles in Soil	38084	4670	1,1-Dichloropropene	8260C	Approved
Volatiles in Soil	38084	5150	1,2,3-Trichlorobenzene	8260C	Approved
Volatiles in Soil	38084	5180	1,2,3-Trichloropropane	8260C	Approved
Volatiles in Soil	38084	5155	1,2,4-Trichlorobenzene	8260C	Approved
Volatiles in Soil	38084	5210	1,2,4-Trimethylbenzene	8260C	Approved
Volatiles in Soil	38084	4570	1,2-Dibromo-3-chloropropane	8260C	Approved
Volatiles in Soil	38084	4585	1,2-Dibromoethane	8260C	Approved
Volatiles in Soil	38084	4610	1,2-Dichlorobenzene	8260C	Approved
Volatiles in Soil	38084	4635	1,2-Dichloroethane	8260C	Approved
Volatiles in Soil	38084	4655	1,2-Dichloropropane	8260C	Approved
Volatiles in Soil	38084	5215	1,3,5-Trimethylbenzene	8260C	Approved
Volatiles in Soil	38084	4615	1,3-Dichlorobenzene	8260C	Approved
Volatiles in Soil	38084	4660	1,3-Dichloropropane	8260C	Approved
Volatiles in Soil	38084	4620	1,4-Dichlorobenzene	8260C	Approved
Volatiles in Soil	38084	4665	2,2-Dichloropropane	8260C	Approved
Volatiles in Soil	38084	4535	2-Chlorotoluene	8260C	Approved
Volatiles in Soil	38084	4540	4-Chlorotoluene	8260C	Approved
Volatiles in Soil	38084	4995	4-Methyl-2-pentanone	8260C	Approved
Volatiles in Soil	38084	4375	Benzene	8260C	Approved
Volatiles in Soil	38084	4385	Bromobenzene	8260C	Approved
Volatiles in Soil	38084	4390	Bromochloromethane	8260C	Approved
Volatiles in Soil	38084	4395	Bromodichloromethane	8260C	Approved
Volatiles in Soil	38084	4400	Bromoform	8260C	Approved
Volatiles in Soil	38084	4950	Bromomethane	8260C	Approved
Volatiles in Soil	38084	4450	Carbon disulphide	8260C	Approved
Volatiles in Soil	38084	4455	Carbon tetrachloride	8260C	Approved
Volatiles in Soil	38084	4475	Chlorobenzene	8260C	Approved
Volatiles in Soil	38084	4485	Chloroethane	8260C	Approved
Volatiles in Soil	38084	4505	Chloroform	8260C	Approved
Volatiles in Soil	38084	4960	Chloromethane	8260C	Approved
Volatiles in Soil	38084	4645	cis-1,2-Dichloroethene	8260C	Approved
Volatiles in Soil	38084	4680	cis-1,3-Dichloropropene	8260C	Approved
Volatiles in Soil	38084	4575	Dibromochloromethane	8260C	Approved

Volatiles in Soil	38084	4595	Dibromomethane	8260C	Approved
Volatiles in Soil	38084	4625	Dichlorodifluoromethane	8260C	Approved
Volatiles in Soil	38084	4765	Ethyl benzene	8260C	Approved
Volatiles in Soil	38084	4835	Hexachlorobutadiene	8260C	Approved
Volatiles in Soil	38084	4840	Hexachloroethane	8260C	Approved
Volatiles in Soil	38084	4900	Isopropylbenzene	8260C	Approved
Volatiles in Soil	38084	5000	Methyl tert-butyl ether (MTBE)	8260C	Approved
Volatiles in Soil	38084	4975	Methylene chloride	8260C	Approved
Volatiles in Soil	38084	5005	Naphthalene	8260C	Approved
Volatiles in Soil	38084	4435	n-Butyl benzene	8260C	Approved
Volatiles in Soil	38084	5090	n-Propylbenzene	8260C	Approved
Volatiles in Soil	38084	4910	p-Isopropyl toluene	8260C	Approved
Volatiles in Soil	38084	4440	sec-Butyl benzene	8260C	Approved
Volatiles in Soil	38084	5100	Styrene	8260C	Approved
Volatiles in Soil	38084	4445	tert-Butyl benzene	8260C	Approved
Volatiles in Soil	38084	5140	Toluene	8260C	Approved
Volatiles in Soil	38084	5260	Total Xylenes	8260C	Approved
Volatiles in Soil	38084	4700	trans-1,2-Dichloroethene	8260C	Approved
Volatiles in Soil	38084	5170	Trichloroethene	8260C	Approved
Volatiles in Soil	38084	5175	Trichlorofluoromethane	8260C	Approved
Volatiles in Soil	38084	5235	Vinyl chloride	8260C	Approved
RCRA BTEX & MTBE	38161	4375	Benzene	8260C	Approved
RCRA BTEX & MTBE	38161	4765	Ethyl benzene	8260C	Approved
RCRA BTEX & MTBE	38161	5140	Toluene	8260C	Approved
RCRA BTEX & MTBE	38161	5000	Methyl tert-butyl ether (MTBE)	8260C	Approved
RCRA BTEX & MTBE	38161	5260	Total Xylenes	8260C	Approved
RCRA Ketones in Soil	38167	4410	2-Butanone (Methyl ethyl ketone)	8260C	Approved
RCRA Ketones in Soil	38167	4860	2-Hexanone	8260C	Approved
RCRA Ketones in Soil	38167	4995	4-Methyl-2-pentanone	8260C	Approved
RCRA Ketones in Soil	38167	4315	Acetone	8260C	Approved
RCRA Oxygenates	38169	5185	1,1,2-Trichlorotrifluoroethane	8260C	Approved
RCRA Oxygenates	38169	4770	Ethyl tert-butyl ether	8260C	Approved
RCRA Oxygenates	38169	9375	Isopropyl ether	8260C	Approved
RCRA Oxygenates	38169	5000	Methyl tert-butyl ether (MTBE)	8260C	Approved
RCRA Oxygenates	38169	5090	n-Propylbenzene	8260C	Approved
RCRA Oxygenates	38169	4370	tert-Amyl methyl ether	8260C	Approved
RCRA Oxygenates	38169	4420	tert-Butyl alcohol (t-Butanol)	8260C	Approved
NPTA			Cyclohexane	8260C	Approved
NPTA			Methyl Acetate	8260C	Approved
NPTA			Methylcyclohexane	8260C	Approved
NPTA			m&p Xylenes	8260C	Approved
NPTA			o-Xylene	8260C	Approved
NPTA			p-isopropyltoluene	8260C	Approved
NPTA			Vinyl Acetate	8260C	Approved
Acenaphthylene in Soils	SPE-003	5505	Acenaphthylene	8270C	Approved
BNAs in Soil	SPE-003	5155	1,2,4-Trichlorobenzene	8270C	Approved
BNAs in Soil	SPE-003	4610	1,2-Dichlorobenzene	8270C	Approved
BNAs in Soil	SPE-003	4615	1,3-Dichlorobenzene	8270C	Approved
BNAs in Soil	SPE-003	4620	1,4-Dichlorobenzene	8270C	Approved
BNAs in Soil	SPE-003	6835	2,4,5-Trichlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6840	2,4,6-Trichlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6000	2,4-Dichlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6130	2,4-Dimethylphenol	8270C	Approved
BNAs in Soil	SPE-003	6175	2,4-Dinitrophenol	8270C	Approved
BNAs in Soil	SPE-003	6185	2,4-Dinitrotoluene (2,4-DNT)	8270C	Approved
BNAs in Soil	SPE-003	6005	2,6-Dichlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6190	2,6-Dinitrotoluene (2,6-DNT)	8270C	Approved
BNAs in Soil	SPE-003	5795	2-Chloronaphthalene	8270C	Approved
BNAs in Soil	SPE-003	5800	2-Chlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6360	2-Methyl-4,6-dinitrophenol	8270C	Approved
BNAs in Soil	SPE-003	6385	2-Methylnaphthalene	8270C	Approved
BNAs in Soil	SPE-003	6400	2-Methylphenol (o-Cresol)	8270C	Approved
BNAs in Soil	SPE-003	6460	2-Nitroaniline	8270C	Approved
BNAs in Soil	SPE-003	6490	2-Nitrophenol	8270C	Approved
BNAs in Soil	SPE-003	5945	3,3'-Dichlorobenzidine	8270C	Approved
BNAs in Soil	SPE-003	6410	3+4-Methylphenol (m+p-Cresol)	8270C	Approved
BNAs in Soil	SPE-003	6405	3-Methylphenol (m-Cresol)	8270C	Approved
BNAs in Soil	SPE-003	6465	3-Nitroaniline	8270C	Approved
BNAs in Soil	SPE-003	5660	4-Bromophenyl phenyl ether	8270C	Approved
BNAs in Soil	SPE-003	5700	4-Chloro-3-methylphenol	8270C	Approved
BNAs in Soil	SPE-003	5745	4-Chloroaniline	8270C	Approved
BNAs in Soil	SPE-003	5825	4-Chlorophenyl phenylether	8270C	Approved
BNAs in Soil	SPE-003	6410	4-Methylphenol (p-Cresol)	8270C	Approved
BNAs in Soil	SPE-003	6470	4-Nitroaniline	8270C	Approved

BNAs in Soil	SPE-003	6500	4-Nitrophenol	8270C	Approved
BNAs in Soil	SPE-003	5500	Acenaphthene	8270C	Approved
BNAs in Soil	SPE-003	5505	Acenaphthylene	8270C	Approved
BNAs in Soil	SPE-003	5545	Aniline	8270C	Approved
BNAs in Soil	SPE-003	5555	Anthracene	8270C	Approved
BNAs in Soil	SPE-003	5595	Benzidine	8270C	Approved
BNAs in Soil	SPE-003	5575	Benzo(a)anthracene	8270C	Approved
BNAs in Soil	SPE-003	5580	Benzo(a)pyrene	8270C	Approved
BNAs in Soil	SPE-003	5585	Benzo(b)fluoranthene	8270C	Approved
BNAs in Soil	SPE-003	5590	Benzo(g,h,i)perylene	8270C	Approved
BNAs in Soil	SPE-003	5600	Benzo(k)fluoranthene	8270C	Approved
BNAs in Soil	SPE-003	5610	Benzoic acid	8270C	Approved
BNAs in Soil	SPE-003	5630	Benzyl alcohol	8270C	Approved
BNAs in Soil	SPE-003	5760	bis(2-Chloroethoxy)methane	8270C	Approved
BNAs in Soil	SPE-003	5765	bis(2-Chloroethyl) ether	8270C	Approved
BNAs in Soil	SPE-003	5780	bis(2-Chloroisopropyl) ether	8270C	Approved
BNAs in Soil	SPE-003	6255	bis(2-Ethylhexyl) phthalate (DEHP)	8270C	Approved
BNAs in Soil	SPE-003	5670	Butyl benzyl phthalate	8270C	Approved
BNAs in Soil	SPE-003	5680	Carbazole	8270C	Approved
BNAs in Soil	SPE-003	5855	Chrysene	8270C	Approved
BNAs in Soil	SPE-003	5895	Dibenz(a,h) anthracene	8270C	Approved
BNAs in Soil	SPE-003	5905	Dibenzofuran	8270C	Approved
BNAs in Soil	SPE-003	6070	Diethyl phthalate	8270C	Approved
BNAs in Soil	SPE-003	6135	Dimethyl phthalate	8270C	Approved
BNAs in Soil	SPE-003	5925	Di-n-butyl phthalate	8270C	Approved
BNAs in Soil	SPE-003	6200	Di-n-octyl phthalate	8270C	Approved
BNAs in Soil	SPE-003	6265	Fluoranthene	8270C	Approved
BNAs in Soil	SPE-003	6270	Fluorene	8270C	Approved
BNAs in Soil	SPE-003	6275	Hexachlorobenzene	8270C	Approved
BNAs in Soil	SPE-003	4835	Hexachlorobutadiene	8270C	Approved
BNAs in Soil	SPE-003	6285	Hexachlorocyclopentadiene	8270C	Approved
BNAs in Soil	SPE-003	4840	Hexachloroethane	8270C	Approved
BNAs in Soil	SPE-003	6315	Indeno(1,2,3-cd) pyrene	8270C	Approved
BNAs in Soil	SPE-003	6320	Isophorone	8270C	Approved
BNAs in Soil	SPE-003	5005	Naphthalene	8270C	Approved
BNAs in Soil	SPE-003	5015	Nitrobenzene	8270C	Approved
BNAs in Soil	SPE-003	6530	n-Nitrosodimethylamine	8270C	Approved
BNAs in Soil	SPE-003	6545	n-Nitroso-di-n-propylamine	8270C	Approved
BNAs in Soil	SPE-003	6535	n-Nitrosodiphenylamine	8270C	Approved
BNAs in Soil	SPE-003	6605	Pentachlorophenol	8270C	Approved
BNAs in Soil	SPE-003	6615	Phenanthrene	8270C	Approved
BNAs in Soil	SPE-003	6625	Phenol	8270C	Approved
BNAs in Soil	SPE-003	6665	Pyrene	8270C	Approved
BNAs in Soil	SPE-003	5095	Pyridine	8270C	Approved
Low-Level PAHs in Soil	722	6665	Pyrene	8270CSIM	Approved
PAHs - Solids	SPE-017	5005	Naphthalene	8270CSIM	Approved
PAHs - Solids	SPE-017	5500	Acenaphthene	8270CSIM	Approved
PAHs - Solids	SPE-017	5505	Acenaphthylene	8270CSIM	Approved
PAHs - Solids	SPE-017	5555	Anthracene	8270CSIM	Approved
PAHs - Solids	SPE-017	5575	Benzo(a)anthracene	8270CSIM	Approved
PAHs - Solids	SPE-017	5580	Benzo(a)pyrene	8270CSIM	Approved
PAHs - Solids	SPE-017	5585	Benzo(b)fluoranthene	8270CSIM	Approved
PAHs - Solids	SPE-017	5590	Benzo(g,h,I)perylene	8270CSIM	Approved
PAHs - Solids	SPE-017	5600	Benzo(k)fluoranthene	8270CSIM	Approved
PAHs - Solids	SPE-017	5855	Chrysene	8270CSIM	Approved
PAHs - Solids	SPE-017	5895	Dibenzo(a,h)anthracene	8270CSIM	Approved
PAHs - Solids	SPE-017	6265	Fluoranthene	8270CSIM	Approved
PAHs - Solids	SPE-017	6270	Fluorene	8270CSIM	Approved
PAHs - Solids	SPE-017	6315	Indeno(1,2,3-cd) pyrene	8270CSIM	Approved
PAHs - Solids	SPE-017	6385	2-Methylnaphthalene	8270CSIM	Approved
PAHs - Solids	SPE-017	6615	Phenanthrene	8270CSIM	Approved
PAHs - Solids	SPE-017	6665	Pyrene	8270CSIM	Approved
BNAs in Soil	SPE-003	5155	1,2,4-Trichlorobenzene	8270D	Approved
BNAs in Soil	SPE-003	4610	1,2-Dichlorobenzene	8270D	Approved
BNAs in Soil	SPE-003	4615	1,3-Dichlorobenzene	8270D	Approved
BNAs in Soil	SPE-003	4620	1,4-Dichlorobenzene	8270D	Approved
BNAs in Soil	SPE-003	6835	2,4,5-Trichlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6840	2,4,6-Trichlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6000	2,4-Dichlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6130	2,4-Dimethylphenol	8270D	Approved
BNAs in Soil	SPE-003	6175	2,4-Dinitrophenol	8270D	Approved
BNAs in Soil	SPE-003	6185	2,4-Dinitrotoluene (2,4-DNT)	8270D	Approved
BNAs in Soil	SPE-003	6005	2,6-Dichlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6190	2,6-Dinitrotoluene (2,6-DNT)	8270D	Approved

BNAs in Soil	SPE-003	5795	2-Chloronaphthalene	8270D	Approved
BNAs in Soil	SPE-003	5800	2-Chlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6360	2-Methyl-4,6-dinitrophenol	8270D	Approved
BNAs in Soil	SPE-003	6385	2-Methylnaphthalene	8270D	Approved
BNAs in Soil	SPE-003	6400	2-Methylphenol (o-Cresol)	8270D	Approved
BNAs in Soil	SPE-003	6460	2-Nitroaniline	8270D	Approved
BNAs in Soil	SPE-003	6490	2-Nitrophenol	8270D	Approved
BNAs in Soil	SPE-003	5945	3,3'-Dichlorobenzidine	8270D	Approved
BNAs in Soil	SPE-003	6410	3+4-Methylphenol (m+p-Cresol)	8270D	Approved
BNAs in Soil	SPE-003	6405	3-Methylphenol (m-Cresol)	8270D	Approved
BNAs in Soil	SPE-003	6465	3-Nitroaniline	8270D	Approved
BNAs in Soil	SPE-003	5660	4-Bromophenyl phenyl ether	8270D	Approved
BNAs in Soil	SPE-003	5700	4-Chloro-3-methylphenol	8270D	Approved
BNAs in Soil	SPE-003	5745	4-Chloroaniline	8270D	Approved
BNAs in Soil	SPE-003	5825	4-Chlorophenyl phenylether	8270D	Approved
BNAs in Soil	SPE-003	6410	4-Methylphenol (p-Cresol)	8270D	Approved
BNAs in Soil	SPE-003	6470	4-Nitroaniline	8270D	Approved
BNAs in Soil	SPE-003	6500	4-Nitrophenol	8270D	Approved
BNAs in Soil	SPE-003	5500	Acenaphthene	8270D	Approved
BNAs in Soil	SPE-003	5505	Acenaphthylene	8270D	Approved
BNAs in Soil	SPE-003	5545	Aniline	8270D	Approved
BNAs in Soil	SPE-003	5555	Anthracene	8270D	Approved
BNAs in Soil	SPE-003	5595	Benzidine	8270D	Approved
BNAs in Soil	SPE-003	5575	Benzo(a)anthracene	8270D	Approved
BNAs in Soil	SPE-003	5580	Benzo(a)pyrene	8270D	Approved
BNAs in Soil	SPE-003	5585	Benzo(b)fluoranthene	8270D	Approved
BNAs in Soil	SPE-003	5590	Benzo(g,h,i)perylene	8270D	Approved
BNAs in Soil	SPE-003	5600	Benzo(k)fluoranthene	8270D	Approved
BNAs in Soil	SPE-003	5610	Benzoic acid	8270D	Approved
BNAs in Soil	SPE-003	5630	Benzyl alcohol	8270D	Approved
BNAs in Soil	SPE-003	5760	bis(2-Chloroethoxy)methane	8270D	Approved
BNAs in Soil	SPE-003	5765	bis(2-Chloroethyl) ether	8270D	Approved
BNAs in Soil	SPE-003	5780	bis(2-Chloroisopropyl) ether	8270D	Approved
BNAs in Soil	SPE-003	6255	bis(2-Ethylhexyl) phthalate (DEHP)	8270D	Approved
BNAs in Soil	SPE-003	5670	Butyl benzyl phthalate	8270D	Approved
BNAs in Soil	SPE-003	5680	Carbazole	8270D	Approved
BNAs in Soil	SPE-003	5855	Chrysene	8270D	Approved
BNAs in Soil	SPE-003	5895	Dibenz(a,h) anthracene	8270D	Approved
BNAs in Soil	SPE-003	5905	Dibenzofuran	8270D	Approved
BNAs in Soil	SPE-003	6070	Diethyl phthalate	8270D	Approved
BNAs in Soil	SPE-003	6135	Dimethyl phthalate	8270D	Approved
BNAs in Soil	SPE-003	5925	Di-n-butyl phthalate	8270D	Approved
BNAs in Soil	SPE-003	6200	Di-n-octyl phthalate	8270D	Approved
BNAs in Soil	SPE-003	6265	Fluoranthene	8270D	Approved
BNAs in Soil	SPE-003	6270	Fluorene	8270D	Approved
BNAs in Soil	SPE-003	6275	Hexachlorobenzene	8270D	Approved
BNAs in Soil	SPE-003	4835	Hexachlorobutadiene	8270D	Approved
BNAs in Soil	SPE-003	6285	Hexachlorocyclopentadiene	8270D	Approved
BNAs in Soil	SPE-003	4840	Hexachloroethane	8270D	Approved
BNAs in Soil	SPE-003	6315	Indeno(1,2,3-cd) pyrene	8270D	Approved
BNAs in Soil	SPE-003	6320	Isophorone	8270D	Approved
BNAs in Soil	SPE-003	5005	Naphthalene	8270D	Approved
BNAs in Soil	SPE-003	5015	Nitrobenzene	8270D	Approved
BNAs in Soil	SPE-003	6530	n-Nitrosodimethylamine	8270D	Approved
BNAs in Soil	SPE-003	6545	n-Nitroso-di-n-propylamine	8270D	Approved
BNAs in Soil	SPE-003	6535	n-Nitrosodiphenylamine	8270D	Approved
BNAs in Soil	SPE-003	6605	Pentachlorophenol	8270D	Approved
BNAs in Soil	SPE-003	6615	Phenanthrene	8270D	Approved
BNAs in Soil	SPE-003	6625	Phenol	8270D	Approved
BNAs in Soil	SPE-003	6665	Pyrene	8270D	Approved
BNAs in Soil	SPE-003	5095	Pyridine	8270D	Approved
PAHs - Solids	SPE-017	5005	Naphthalene	8270DSIM	Approved
PAHs - Solids	SPE-017	5500	Acenaphthene	8270DSIM	Approved
PAHs - Solids	SPE-017	5505	Acenaphthylene	8270DSIM	Approved
PAHs - Solids	SPE-017	5555	Anthracene	8270DSIM	Approved
PAHs - Solids	SPE-017	5575	Benzo(a)anthracene	8270DSIM	Approved
PAHs - Solids	SPE-017	5580	Benzo(a)pyrene	8270DSIM	Approved
PAHs - Solids	SPE-017	5585	Benzo(b)fluoranthene	8270DSIM	Approved
PAHs - Solids	SPE-017	5590	Benzo(g,h,I)perylene	8270DSIM	Approved
PAHs - Solids	SPE-017	5600	Benzo(k)fluoranthene	8270DSIM	Approved
PAHs - Solids	SPE-017	5855	Chrysene	8270DSIM	Approved
PAHs - Solids	SPE-017	5895	Dibenzo(a,h)anthracene	8270DSIM	Approved
PAHs - Solids	SPE-017	6265	Fluoranthene	8270DSIM	Approved
PAHs - Solids	SPE-017	6270	Fluorene	8270DSIM	Approved

PAHs - Solids	SPE-017	6315	Indeno(1,2,3-cd) pyrene	8270DSIM	Approved
PAHs - Solids	SPE-017	6385	2-Methylnaphthalene	8270DSIM	Approved
PAHs - Solids	SPE-017	6615	Phenanthrene	8270DSIM	Approved
PAHs - Solids	SPE-017	6665	Pyrene	8270DSIM	Approved
Dioxins and Furans in Soil	SPE-016	9612	2,3,7,8-TCDD	8290	Approved
Dioxins and Furans in Soil	SPE-016	9606	PCDD + PCDF, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9992	PCDD, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9615	TCDD, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9519	1,2,3,4,6,7,8,9-OCDD	8290	Approved
Dioxins and Furans in Soil	SPE-016	9516	1,2,3,4,6,7,8,9-OCDF	8290	Approved
Dioxins and Furans in Soil	SPE-016	9426	1,2,3,4,6,7,8-Hpcdd	8290	Approved
Dioxins and Furans in Soil	SPE-016	9420	1,2,3,4,6,7,8-Hpcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9423	1,2,3,4,7,8,9-Hpcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9453	1,2,3,4,7,8-Hxcdd	8290	Approved
Dioxins and Furans in Soil	SPE-016	9471	1,2,3,4,7,8-Hxcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9456	1,2,3,6,7,8-Hxcdd	8290	Approved
Dioxins and Furans in Soil	SPE-016	9474	1,2,3,6,7,8-Hxcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9459	1,2,3,7,8,9-Hxcdd	8290	Approved
Dioxins and Furans in Soil	SPE-016	9477	1,2,3,7,8,9-Hxcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9540	1,2,3,7,8-Pecdd	8290	Approved
Dioxins and Furans in Soil	SPE-016	9543	1,2,3,7,8-Pecdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9480	2,3,4,6,7,8-Hxcdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9549	2,3,4,7,8-Pecdf	8290	Approved
Dioxins and Furans in Soil	SPE-016	9606	2,3,7,8-TCDD	8290	Approved
Dioxins and Furans in Soil	SPE-016	9989	2,3,7,8-TCDF	8290	Approved
Dioxins and Furans in Soil	SPE-016	9438	Hpcdd, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9444	Hpcdf, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9468	Hxcdd, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9483	Hxcdf, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9992	PCDD + PCDF, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9991	PCDD, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9993	PCDF, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9555	Pecdd, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9552	Pecdf, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9989	TCDD, total	8290	Approved
Dioxins and Furans in Soil	SPE-016	9991	TCDF, total	8290	Approved
RCRA Carbamates	38158	7710	3-Hydroxycarbofuran	8321A	Approved
RCRA Carbamates	38158	7010	Aldicarb	8321A	Approved
RCRA Carbamates	38158	7015	Aldicarb sulfone	8321A	Approved
RCRA Carbamates	38158	7020	Aldicarb sulfoxide	8321A	Approved
RCRA Carbamates	38158	8080	Baygon (Propoxur)	8321A	Approved
RCRA Carbamates	38158	7195	Carbaryl	8321A	Approved
RCRA Carbamates	38158	7205	Carbofuran	8321A	Approved
RCRA Carbamates	38158	9384	Dioxacarb	8321A	Approved
RCRA Carbamates	38158	7505	Diuron	8321A	Approved
RCRA Carbamates	38158	7800	Methiocarb	8321A	Approved
RCRA Carbamates	38158	7805	Methomyl	8321A	Approved
RCRA Carbamates	38158	8025	Promecarb	8321A	Approved
RCRA Nitroaromatics in Soil	38155	6885	1,3,5-Trinitrobenzene	8330	Approved
RCRA Nitroaromatics in Soil	38155	6160	1,3-Dinitrobenzene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9651	2,4,6-Trinitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	6185	2,4-Dinitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	6190	2,6-Dinitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9303	2-Amino-4,6-dinitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9507	2-Nitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9510	3-Nitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9306	4-Amino-2,6-dinitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9513	4-Nitrotoluene	8330	Approved
RCRA Nitroaromatics in Soil	38155	9522	HMX	8330	Approved
RCRA Nitroaromatics in Soil	38155	5015	Nitrobenzene	8330	Approved
NPTA			Nitroglycerin	8330	Approved
NPTA			PGDN	8330	Approved
NPTA			Picric Acid	8330	Approved
NPTA			PETN	8330	Approved
RCRA Nitroaromatics in Soil	38155	9432	RDX	8330	Approved
RCRA Nitroaromatics in Soil	38155	6415	Tetryl	8330	Approved
RCRA Nitroaromatics in Soil	38155	6885	1,3,5-Trinitrobenzene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	6160	1,3-Dinitrobenzene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9651	2,4,6-Trinitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	6185	2,4-Dinitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	6190	2,6-Dinitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9303	2-Amino-4,6-dinitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9507	2-Nitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9510	3-Nitrotoluene	8330A	Approved

RCRA Nitroaromatics in Soil	38155	9306	4-Amino-2,6-dinitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9513	4-Nitrotoluene	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9522	HMX	8330A	Approved
RCRA Nitroaromatics in Soil	38155	5015	Nitrobenzene	8330A	Approved
NPTA			Nitroglycerin	8330A	Approved
NPTA			PGDN	8330A	Approved
NPTA			Picric Acid	8330A	Approved
NPTA			PETN	8330A	Approved
RCRA Nitroaromatics in Soil	38155	9432	RDX	8330A	Approved
RCRA Nitroaromatics in Soil	38155	6415	Tetryl	8330A	Approved
RCRA Nitroaromatics in Soil	38155	6885	1,3,5-Trinitrobenzene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	6160	1,3-Dinitrobenzene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9651	2,4,6-Trinitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9185	2,4-Dinitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	6190	2,6-Dinitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9303	2-Amino-4,6-dinitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9507	2-Nitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9510	3-Nitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9306	4-Amino-2,6-dinitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9513	4-Nitrotoluene	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9522	HMX	8330B	Approved
RCRA Nitroaromatics in Soil	38155	5015	Nitrobenzene	8330B	Approved
NPTA			Nitroglycerin	8330B	Approved
NPTA			PGDN	8330B	Approved
NPTA			Picric Acid	8330B	Approved
NPTA			PETN	8330B	Approved
RCRA Nitroaromatics in Soil	38155	9432	RDX	8330B	Approved
RCRA Nitroaromatics in Soil	38155	6415	Tetryl	8330B	Approved
RCRA Cyanide	55105	1645	Cyanide	9010B	Approved
RCRA Cyanide	55105	1645	Cyanide	9010C	Approved
RCRA Cyanide	55105	1645	Cyanide	9014	Approved
RCRA Corrosivity - pH Determination	55127	1625	Corrosivity	9045C	Approved
RCRA Corrosivity - pH Determination	55127	1625	Corrosivity	9045D	Approved
RCRA Anions	55141	1541	Bromide (Br)	9056	Approved
RCRA Anions	55141	1576	Chloride (Cl)	9056	Approved
RCRA Anions	55141	1731	Fluoride (F)	9056	Approved
RCRA Anions	55141	1811	Nitrate as N (NO3- as N)	9056	Approved
RCRA Anions	55141	1871	Phosphate as P (PO43- as P)	9056	Approved
RCRA Anions	55141	2001	Sulfate (SO42-)	9056	Approved
RCRA Anions	55141	1540	Bromide (Br)	9056A	Approved
RCRA Anions	55141	1575	Chloride (Cl)	9056A	Approved
RCRA Anions	55141	1730	Fluoride (F)	9056A	Approved
RCRA Anions	55141	1810	Nitrate as N (NO3- as N)	9056A	Approved
RCRA Anions	55141	1870	Phosphate as P (PO43- as P)	9056A	Approved
RCRA Anions	55141	2000	Sulfate (SO42-)	9056A	Approved
RCRA Nutrients	55142	2040	TOC	Walkley Black	Approved
Nutrients	PEO-014	2040	TOC	Walkley Black	Approved